Catalogue No. 22.

Gladding, McBean & Co.

CHARLES GLADDING, *President* — GEORGE CHAMBERS, *Vice-President* — P. McG. McBEAN, *Secretary.*

Established 1875. — *Incorporated 1886.*

CATALOGUE No. 22

—OF—

GLADDING, McBEAN & CO.

MANUFACTURERS OF

VITRIFIED, SALT GLAZED

SEWER PIPE,

ALSO

WATER PIPE, TERRA-COTTA CHIMNEY PIPE AND TOPS.

Architectural Terra-Cotta,

Lawn Vases,
Flower Pots,
Drain Tile,
Acid Receivers,
Roman Brick,
Fire Brick,
Fire Clay,
Stove Linings,
Acid Crocks,
Enameled Brick,
Fire Tile,
Fire Brick Dust,
Culvert Pipe,
Well Tubing,
Etc., Etc.

FIRE PROOFING

FOR BUILDING PURPOSES.

MANUFACTORY AT LINCOLN, PLACER COUNTY, CAL.

Lincoln is on the Oregon Division of the Central Pacific R. R., 10 miles from its junction with the Central Pacific.

San Francisco Office and Depot:

NOS. 1358 AND 1360 MARKET STREET.

Telephone No. 3041.

TO THE TRADE.

We would respectfully present for your consideration a Catalogue and Price List of the principal articles manufactured by us, giving also sufficient illustrations of the same to enable those who are not familiar with such goods to make their orders understandingly. Should you require anything in our line, which is not specified herein, send us a full description and drawing of the article required, and in all probability we can furnish it with reasonable dispatch.

Every description of **ARCHITECTURAL TERRA-COTTA** *work made to order.*

We make a specialty of furnishing **FIRE-PROOFING** *for building purposes.*

Our first aim is, excellence in quality and to produce such goods as are certain to give satisfaction. How well we have succeeded in this we think is answered by the rapid increase of our business. We have been compelled to add to the capacity of our works yearly, to meet the increasing demand for our goods.

Thankful for your past patronage, and promising increased efforts to turn out satisfactory work, we solicit a continuance of your trade.

Yours truly,

Gladding, McBean & Co.

☞ *A liberal discount to the trade.*

The numbers and prices given in this Catalogue, supersede those in previous issues.

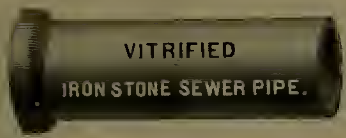
Do not cut or tear this Catalogue to send us the Engravings.

In ordering, give the Engraving Number and the Size of article wanted.

For Index see Pages 94 and 95.

"GET THE BEST."

Our Salt Glazed



Is the Standard wherever it has been brought before the Public.

True in Form, Perfectly Fitting Joints, Compactness of Body.

Sold as Low as any Pipe of Equal Quality.

It is manufactured from a combination of the celebrated **LINCOLN CLAYS**, which, by careful analysis, are found to be unequaled for this purpose.

By **skilled** labor and **powerful machinery**, of the **latest** and **best designs**, the material is rendered homogeneous and uniform throughout—under **great pressure** (steam presses being used for the purpose), the pipe is made **very compact** and at **high temperature** becomes of a thoroughly **vitrified** and **iron-like body**, which is **impervious** to the **action of acids, gases and steam, all** of which are found in the city sewers.

The kilns in which these pipes are burned are so constructed as to secure a uniform heat, vitrifying each piece of pipe. Tests of a similar pipe, by hydrostatic pressure, at the East, where it has been used for over thirty years, with entire satisfaction to city authorities, and also by external crushing at the Navy Yard at Washington, in competition with the best American, English and Scotch Pipe, showed a strength superior to any other pipe.

With largely increased facilities for manufacturing, this pipe can now be offered in quantities to suit purchasers, in sizes from 3 to 24-inch caliber, with the latest and most improved fittings.

Standard Patterns of Sewer Pipe and Fittings.

Fig. 1.

Fig. 2.

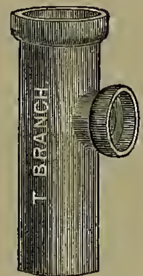


Fig. 3.

Fig. 6.

Fig. 7.

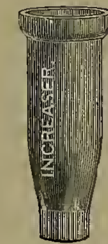


Fig. 8.

Fig. 5.

Fig. 11.

Fig. 10.

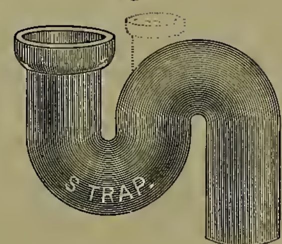


Fig. 9.

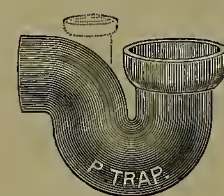


Fig. 4.

SEE DESCRIPTION ON PAGE 6.

Price List of Standard Vitrified Salt Glazed Sewer Pipe and Fittings.

Caliber of Pipe.	Price of Pipe, Per Foot.	Branches, Each.	Curves and Elbows, Each.	Reducers or Increasers, Each.	Hand-Hole Traps, Each.	P* Traps, Each.	S* Traps, Each.	Weight of Pipe, Per Foot.	Feet to Carload of 10 Tons.	Area in Inches.	Thickness of Pipe	Caliber of Pipe
3 Inch	$0 15	$ 60	$ 50	....	$1 75	$1 25	$1 75	6½ Lbs.	3000	7	½ Inch	3 Inch
4 Inch	20	80	60	$ 60	2 00	1 50	2 00	9 Lbs.	2200	12½	½ Inch	4 Inch
5 Inch	25	1 00	75	75	2 50	2 00	2 50	13 Lbs.	1540	19½	⅝ Inch	5 Inch
6 Inch	30	1 20	1 00	90	3 00	2 50	3 00	16 Lbs.	1250	28¼	¾ Inch	6 Inch
8 Inch	40	1 60	1 50	1 20	4 00	....	....	22 Lbs.	900	50¼	¾ Inch	8 Inch
10 Inch	60	2 40	2 10	1 80	6 00	....	....	31 Lbs.	650	78½	⅞ Inch	10 Inch
12 Inch	75	3 00	2 75	2 25	....	....	....	41 Lbs.	490	113	⅞ Inch	12 Inch
14 Inch	1 00	4 00	3 75	3 00	....	....	....	50 Lbs.	400	154	1 Inch	14 Inch
16 Inch	1 25	5 00	4 25	3 75	....	....	....	66 Lbs.	300	201	1⅛ Inch	16 Inch
18 Inch	1 50	6 00	4 75	4 50	....	....	....	80 Lbs.	250	254½	1¼ Inch	18 Inch
20 Inch	1 75	7 00	5 75	5 25	....	....	....	90 Lbs.	220	314	1¼ Inch	20 Inch
22 Inch	2 10	8 40	7 00	6 30	....	....	....	105 Lbs.	190	380	1⅜ Inch	22 Inch
24 Inch	2 50	10 00	8 00	7 50	....	....	....	120 Lbs.	170	452½	1½ Inch	24 Inch

*P and S Traps, with Hand Holes, 25 cents extra.

Slants (for Brick Sewers) once and a half the price of Pipe per foot, measured on the long side.

NOTE.—Our Pipe and Branches are furnished in two-foot lengths. See description on page 6.

DISCOUNT, PER CENT.

Description of Sewer Pipe and Fittings.

(See illustrations and price list on pages 4 and 5.)

Sewer Pipe.—We make our Sewer Pipe with sockets, two feet in length, and 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 22 and 24 inches inside diameter.

Y and T Branches.—Our branches are made in two-foot lengths, with either Y or T inlets. The inlets on 3, 4, 5, 6, 8 and 10-inch pipe can be of any of these sizes, but not exceeding the main in diameter; thus, on a six-inch pipe the inlets can be 3, 4, 5 or 6-inch, and on a 10-inch pipe, 3, 4, 5, 6, 8 or 10-inch.

The inlets on 12, 14, 16 and 18-inch pipe can be of any size from six inches, to within two inches of the main in diameter; thus, inlets on 18-inch pipe are 6, 8, 10, 12, 14 or 16-inch. Smaller inlets on these sizes are made to order. Inlets on 24-inch pipe we make to order, and they can be of any size up to eighteen inches.

Y inlets should be used wherever practicable, so that the two currents may flow in the same direction. T branches tend to form eddies, and consequently deposits in the main sewer.

Elbows and Curves—Of 3, 4, 5, 6, 8, 10, 12, 14, 16 and 18 inches in diameter, are always kept in stock, and larger sizes are made to order.

Hand Hole Trap.—We make these of 3, 4, 5, 6, 8 and 10-inch diameter, with hand holes or fresh-air inlets. When the sewer is deep, the *hand hole* can be lengthened by placing one or more pieces of pipe of the requisite size upon the hand hole of the trap, through which the trap can be cleansed when desired.

Our 4, 5, 6, 8 and 10-inch *traps* are provided with 4-inch *hand holes*, and the 3-inch traps with 3-inch *hand holes.*

P Trap.—This trap is used to form a trap with a perpendicular into a horizontal pipe at the upper end of the sewer, or under the bowl of a water closet. The soil from the hopper falls directly into the water, and will not adhere to the pipe. This trap has the advantage of a perpendicular fall of sewerage to assist in dislodging solid matter.

We make these of 3, 4, 5 and 6-inch diameter; the 4, 5 and 6-inch with 4-inch hand holes, if desired.

S Trap.—An *S trap* is used to form a trap with two perpendicular pipes, in the upper stories of buildings. They have the same advantages as the P *trap* over the other forms. We make these of 3-inch, 4-inch, 5-inch and 6-inch diameter, the 4, 5 and 6-inch with hand holes, if desired.

Reducers and Increasers.—These are used to *reduce* or *increase* the size of sewers. When ordering, give the inside diameter at both ends, also on which end (small or large) the socket is required. If this is done, there will be no mistakes made in filling orders.

Slants.—In the construction of a brick sewer, *slants* should be built into the wall, to receive the lateral or side sewers, the bevel of the slant being flush with the inside of the main sewer, thus forming a Y branch.

Our "Second Quality" Sewer Pipe.

To Railroad Companies, County Commissioners, City Authorities, Civil Engineers, Builders, Contractors, Farmers, and to all whom it may concern.

Through the process of burning, some of the pipes are liable to blister, crack, or lose their perfect form, which renders them unfit for city or private sewers, in which all manner of filth is conducted; but for drainage of ordinary

Cities and Towns, Swamp Lands, Culverts for Railroads, Roadways, and Linings for Wells.

they answer the purpose, and can be bought at a much less price. [See Price List on this page.]

Price List of Second-Class Vitrified Sewer Pipe.

Caliber of Pipe.	Price per Foot.	Area in Inches.	Weight per Foot.	Feet to Carload of 10 Tons.
6 Inch	$0.15	28¼	16 Lbs.	1250
8 Inch	.20	50¼	22 Lbs.	900
10 Inch	.30	78½	31 Lbs.	650
12 Inch	.37½	113	41 Lbs.	490
14 Inch	.50	154	50 Lbs.	400
16 Inch	.62½	201	66 Lbs.	300
18 Inch	.75	254½	80 Lbs.	250
20 Inch	.87½	314	90 Lbs.	220
22 Inch	1.05	380	105 Lbs.	190
24 Inch	1.25	452½	120 Lbs.	170

Water Closet Bowl.

Slop Hopper.

Price and Dimensions of Water Closet Bowls.

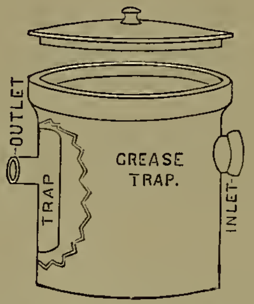
No. 1	Depth...... 9 Inches.	Width......13 Inches.	Price......$1.00
No. 2	" ......10 "	" ......15 "	" 1.25
No. 3	" ......14 "	" ......15 "	" 1.50

Price and Dimensions of Slop Hoppers.

Depth, 9 Inches .... | Width, 13 Inches.......... Price, 75 Cents..........

Grease Traps.

Inside Diameter of Outlet 3 inches.



Inside Diameter of Inlet 3 inches.

NOTICE. Use three inch pipe to connect grease traps with the lateral sewers.

Price List of Grease Traps.

Number.	Price.	Inside Diameter.	Depth.	Capacity.
1	$4 00	12 inches	13 inches	3 gallons
2	5 00	16 inches	18 inches	7 gallons

We call the attention of Architects, Contractors, Masons, Plumbers and all persons who lay drains, to the above invention for preventing the fouling and obstruction of sewers and drains by the deposit of grease therein.

The most common and certain cause of obstruction to house-drains arises from grease, which, though fluid when hot, soon cools in the drains, and gradually, but certainly, closes them up. We have known drains thirty to fifty feet in length closed nearly the whole distance from this cause. The amount which will collect from the waste of a single family is surprising to those who are not familiar with the subject. It ordinarily causes much more expense and inconvenience to allow this substance to run into the drain than to catch it in a grease trap, from which it can conveniently be removed.

This method of catching the grease keeps the sewer clean, and by not permitting it to enter the sewer, of course does away with the possibility of decomposition of this substance, thus disposing effectually of one of the most active agents in creating that poisonous **SEWER GAS** so dangerous to health.

We earnestly recommend the use of the above trap in all drains leading from sinks in kitchens, as it will be found thoroughly effective in its operation.

N. B.—Place as near the kitchen sink as possible, so that there shall be the least practicable length of pipe to accumulate grease.

They are made of the same material as our sewer pipe.

Sewerage:

General Information on the Subject.

Owing to the prevalence of malignant fevers, directly traceable to violations of sanitary laws, the public has begun to realize the necessity for thorough systems of sewerage and drainage, and is inquiring into the mode of obtaining the most satisfactory results.

Fortunately a large amount of data is at hand to be drawn from, based upon the practical experience of many years close and intelligent observation by eminent civil engineers, possessing special attributes for their work, and whose observations come to us officially embodied in exhaustive reports to boards of commissioners, city councils, state legislatures and national legislative bodies.

The information to be derived from a careful perusal of all the literature on sanitary drainage would be of incalculable benefit to all, yet few have the time and fewer still the inclination to thoroughly study this subject.

Hence, we have condensed a few facts which we take the liberty of presenting to a thinking public. For further details, we refer our readers to such works as "Sewerage and Land Drainage," by Col. Geo. E. Waring; and "Sanitary Engineering," by Baldwin Latham.

We will mail to any one on application, Col. Waring's report on the sewerage system of Memphis, Tenn. This report is most valuable to engineers and others interested in sewerage.

Under the Mosaic law, a strict observance of sanitary laws was a part of their religious duty; but in time "the people sank to the lowest depths of sanitary neglect, from which the powerful voices of typhus, plague and cholera were the first to arouse them."

Impure air, produced by decomposing matter, or germs of disease, which abound in large cities or towns imperfectly drained, and found in a lesser degree in the country surrounding the same, poisons the blood effectually.

Water having the power of drawing and absorbing the impurities from the air, may become freighted with the germs of disease.

Your well drains the water from the surrounding earth a long distance. It is estimated that a well will drain five feet in all directions for every foot in depth, thus a well twenty feet deep will drain a space two hundred feet in diameter.

Filth chemically mixed with water cannot be filtered from it, hence the danger of vaults and cesspools, from which the liquids are absorbed by the earth. Residence on a damp soil engenders consumption, while drainage of that soil lessens it.

The impurities from a vault, seeping into a well in a New York village, gave typhoid fever to 43 persons, of whom 10 died.

Impurities from a vault getting into the water pipes of Over Darwin, England, produced 2,035 cases of typhoid fever, including 104 deaths.

In London, in 1848-9, a single well, though yielding apparently clear, refreshing water, caused the death of 500 persons by cholera in one week, the water being impregnated with decomposing sewage.

Fifty-six out of 74 pupils in a young ladies' seminary at Pittsfield, Mass., had typhoid and 16 died. Cause, pollution of air and water from vaults and cellars improperly drained.

There are very numerous similar cases on record, and how many where the cause was never discovered?

The reduction in death rate, wherever sanitary drainage is thoroughly adopted, proves its benefits beyond question.

Results of Sanitary Drainage in Twelve English Towns.

NAME OF PLACE.	Population in 1861	Average mortality per 1000 before construction of works	Average mortality per 1000 since construction of works	Saving of life — per cent.	Reduction of typhoid fever—rate per cent.	Reduction on the rate of phthisic—per cent.
Bandbury	10,238	23.4	20.5	12½	48	41
Cardiff	32,954	33.2	22.6	32	40	17
Croydon	30,229	23.7	18.6	22	63	17
Dover	23,108	22.6	20.9	7	39	20
Ely	7,847	23.9	20.5	14	56	47
Leicester	68,056	26.4	25.2	4½	48	32
Macclesfield	27,475	29.8	23.7	20	48	31
Merthyr	52,778	33.2	26.2	18	60	11
Newport	24,756	31.8	21.6	32	36	32
Rugby	7,818	19.1	18.6	2½	10	43
Salisbury	9,030	27.5	21.9	20	75	49
Warwick	10,570	22.7	21.0	7½	52	19

MATERIAL.

Stone, brick, cement, wood and vitrified clay pipe have all been tested for years, and the merits and demerits of each are now so well understood, that we think it safe to say that the vitrified pipe sewer is altogether preferable to any other known material, for such sizes as it can be obtained.

Stone and brick are rough, as well as porous, and allow the poisonous liquids and gases to permeate the ground surrounding them, infecting contiguous wells and streams.

Cement pipe is quickly disintegrated by the action of the acids and alkalies always found in sewers, and cannot be relied upon, as is clearly proven by a large number of letters written by the most prominent engineers in various parts of the United States, to the City Engineer of St. Louis, in response to his request for their views and experience as to the comparative value of cement and vitrified stone pipe. (We have these letters in printed form, and will send a copy to any one interested.) Wood is but short lived, and requires replacing every few years.

A vitrified salt glazed pipe can never wear out, cannot be penetrated by acids or alkalies, is not affected by frost, and is the smoothest material known for sewers, by reason of which the friction is reduced to a minimum, and the capacity thereby increased over stone or brick, from thirty to fifty per cent.

Comparative Cost of Cleaning Brick and Pipe Sewers in New York, from 1867 to 1871.

Year	Brick Sewers.			Pipe Sewers.			Proportion of brick to pipe.	Proportionate cost of cleaning brick and pipe sewers
	Total length in city in linear feet	No. of loads removed.	Cost of removal	Total length in linear feet	No. of loads removed.	Cost of removal		
1867	1,058,136	13,073	$32,682	150,022	50	$125	7.05 to 1	261.46 to 1
1868	1,068,817	19,358	48,295	222,020	80	200	4.81 to 1	241.48 to 1
1869	1,088,911	11,002	27,730	288,120	200	500	3.78 to 1	55.46 to 1
1870	1,120,234	18,548	46,420	335,313	597	1,442	3.34 to 1	32.18 to 1
1871	1,152,054	17,374	43,435	346,903	502	1,255	3.32 to 1	34.61 to 1

The cost given in the schedule for pipe sewers includes the expense of repairs, the removal of broken pipes encountered, and relaying new ones.

In all cases where the pipe sewers have required cleaning or repairs, their failure to work has been traced to error or unfaithfulness in their construction.

SIZE.

The size of a sewer should be proportioned to the work it is expected to perform.

A four-inch pipe, if well graded, will carry off all the rainfall — which is the measure of the largest demand upon it, of an ordinary city house and lot. A six-inch drain will serve the largest house.

Cross section of a 3x5 foot brick sewer, filled by the gradual accumulation of silt until only sufficient water-way is left for the smallest constant flow.

Old time sewers were built sufficiently large to be entered and cleaned out, almost regardless of the quantity they were expected to carry off; as it was taken as a matter of course they would frequently fill up with sediment from the flowing sewage, and so they did fill up in many cases, being built twice and three times as large as there was any necessity for. In such cases there is not only a useless expense in construction, but the sewer will not begin to do the work as well as one of proper size. For example, suppose a stream four feet wide and two inches deep, on a slight grade the current would be very slow, and sediment would be deposited on the bottom of the sewer, perhaps finally choking it up. But contract the width to one foot, the current would then be eight inches deep, and the friction but one-fourth as much as before, and the velocity of the stream increased so greatly as to sweep everything before it, and make the sewer self-cleansing.

Sewers choke and overflow during heavy storms, mainly because they are too large for the work they are ordinarily called upon to perform. If a sewer is so small that its usual flow is concentrated to a sufficient depth to carry before it any ordinary obstruction, it will keep itself clean. But if, as is almost always the case where the engineer lacks experience or where he defers to the ignorance of the local authorities, it is so large that its ordinary flow is hardly more than a film, with no power even to remove sand, we may be quite sure that its refuse solid matters will gradually accumulate until they leave near the crown of the arch only the space needed for the smallest constant stream. A smaller sewer would have been kept clear by its own flow.

The passion for too large sewers seems to be an almost universal one. The feeling is that it is best to make the conduit "big enough, anyhow," and as a result, nearly every drain that is laid, in town or country, is so much larger than is needful that the expense of keeping it clean is often the most serious item of cost connected with it. It cannot be too often reiterated that the great purpose of modern water sewerage is to remove immediately, and entirely beyond the occupied portions of a town, all manner of domestic waste and filth before it has time to enter into decomposition; thus preventing an accumulation of dangerous matter and obviating the necessity of employing men in the unwholesome work of hand-cleaning cesspools and sewers of deposit, *which all sewers are apt to become when materially too large for the work they have to perform.*

Again, too much allowance is frequently made for the accessions from lateral drains at various points between the beginning and outlet of the main sewer. It must be remembered that though a pipe may be full at the head, it may, by reason of increasing velocity of the stream, be but two-thirds full in the middle, and but half full at the mouth. Not only this, but these accessions, if by junctions at an obtuse angle, or Y, offer but little resistance, and are frequently found to increase the velocity, without swelling the sectional area. A right angle, or T junction, must necessarily offer more resistance; hence the Y should always be used when practicable.

After draining the subsoil where necessary, with drain tile, and taking care of the surface water as far as practicable, by gutters, etc., what remains, together with the sewage from houses, must be estimated to decide upon the necessary size of the sewer to be constructed.

The sewage proper, of the city of London, is 29 gallons per head of population, in 24 hours; Liverpool, 32 gallons, and the average of 120 English towns, 25 gallons.

The London sewers are constructed to carry six cubic feet of sewage per head, and one inch of rain fall, in twenty-four hours.

An allowance for eight cubic feet of sewage per head, and the estimated rainfall that must be provided for, at the rate of one inch per hour, is doubtless sufficient to cover variations.

In making estimates, the following facts should be borne in mind:

A smooth inner surface sewer offers much less resistance to the flow of water, than a rough surface, and is much less liable to catch sediment or obstructions of any kind.

The greater the inclination, the smaller the sewer need be.

A large portion of the rainfall never reaches the drain, owing to evaporation, absorption, and various obstructions, and it is considered safe to estimate that not more than two-thirds of a given rain can reach the sewer within the hour it falls.

INCLINATION.

All sewers should have the greatest possible fall or inclination; the greater the inclination the greater the velocity. In order to prevent deposit in sewers it is necessary to provide a certain velocity in the flow of sewage, which must be secured throughout the whole system of sewers, and such velocity must be sufficient to prevent the subsidence from the liquid of any matters in suspension, and also to move along the bed of the channel any solid deposits.

In order to prevent deposits in sewers, the following velocities should be maintained:

For sewers of six to ten inches in diameter, a velocity of at least three feet per second is required.

Sewers twelve to twenty-four inches in diameter require a velocity of two and a half feet per second; and in sewers of larger dimensions, in no case should the velocity be less than two feet per second.

"The minimum velocity of two feet per second should be exceeded wherever possible."

"There is a limit in the other direction which has not yet been determined. It is well recognized among sewerage engineers that the fall of a sewer may be too steep—that is, that it may cause the flow to be drawn out to a thread of a stream so small as to lack depth and force, in spite of its velocity, to carry solid matters along."

The following valuable table will assist in making calculations:

Inclination of Circular Sewers.

FOR VELOCITIES FROM TWO TO FOUR FEET PER SECOND, RUNNING FULL OR HALF FULL.

DIAMETER IN INCHES.	Velocity, 2 feet per Second.	Velocity, 2.5 feet per Second.	Velocity, 3 feet per Second.	Velocity, 3.5 feet per Second.	Velocity, 4 feet per Second.
3	1 in 145	1 in 96	1 in 68	1 in 51	1 in 39
4	" 194	" 129	" 92	" 68	" 53
5	" 243	" 160	" 115	" 85	" 66
6	" 292	" 193	" 137	" 102	" 80
8	" 389	" 257	" 183	" 137	" 106
10	" 486	" 322	" 229	" 171	" 133
12	" 583	" 386	" 275	" 205	" 159
14	" 685	" 452	" 322	" 241	" 187
16	" 777	" 513	" 366	" 273	" 212
18	" 875	" 579	" 412	" 307	" 239
20	" 972	" 643	" 458	" 342	" 265
22	" 1069	" 708	" 504	" 376	" 292
24	" 1166	" 772	" 550	" 410	" 318

FLUSHING.

No system of sewerage that is not kept clean by its own flow, or by daily flushing, can satisfy even moderate sanitary requirements. To depend on the occasional flushing of infrequent rains is not sufficient. It is often possible to pond sewerage in large flush-tanks in sufficient volume, to give a good cleansing to main sewers.

The Requirements of a Good Sewer.

1. It must be perfectly tight from one end to the other, so that all matters entering it shall surely be carried to its outlet, not a particle of impurity leaking through into the soil.

2. It must have a continuous fall from the head to the outlet, in order that its contents may "keep moving," so that there shall be no halting to putrify by the way, and no depositing of silt that would endanger the channel.

3. It must be perfectly ventilated, so that the poisonous gases that necessarily arise, even when decomposing matters are being carried along in water, shall be diluted with fresh air, and shall have such means of escape as will prevent them from forcing their way into houses through the traps in the house-drains.

4. It must be provided with means for inspection and flushing.

5. The branches by which it receives its supply should be so regulated as to admit nothing that will be liable to choke up the channel.

6. There must be some device to prevent the gases of the sewer from rising through the house-drains or through the street basins.

Water Consumed in Cities and Towns.

According to the report of various cities for 1882, the following was the number of gallons used per capita per diem in each:

Boston	99	gallons to	each individual	daily.
Chicago	114	"	"	"
Detroit	149	"	"	"
Philadelphia	66	"	"	"
New York	79	"	"	"
Washington	176	"	"	"

Mr. Fanning, authority upon water supply, gives the following as the approximate consumption of water in American cities:

a. For ordinary domestic use (not including hose), twenty gallons per capita per day.

b. For private stables, including carriage washing, when reckoned on the basis of inhabitants, three gallons per capita per day.

c. For commercial and manufacturing purposes, 5 to 15 gallons per capita per day.

d. For fountains—drinking and ornamental—three to ten gallons per capita per day.

e. For fire purposes, one to ten gallons per capita per day.

f. For private hose, sprinkling streets and yards, ten gallons per capita per day during the four driest months of the year.

g. Waste, to prevent freezing of water in service pipes, and house fixtures in Northern cities, ten gallons per capita per day during the three coldest months of the year.

h. Waste by leakage of pipes and fixtures and use for flushing purposes, from five gallons per capita per day upward.

Finally, Mr. Fanning gives the following as the approximate estimate of the average daily consumption, basing his calculations entirely upon the population:

Places of 10,000 population, 35 to 45 gallons per capita.
Places of 20,000 population, 40 to 50 gallons per capita.
Places of 30,000 population, 45 to 65 gallons per capita.
Places of 50,000 population, 55 to 75 gallons per capita.
Places of 75,000 and upwards, 60 to 100 gallons per capita.

This estimate corresponds with the estimates made by other authorities on the subject of water supply. It will be seen from this, that, while an average of fifty gallons per capita per day is the requirement of a water supply, only twenty gallons per capita per day are required for the ordinary domestic purposes. The other thirty gallons may be regarded as necessary to supply the demands of luxury or business necessity.

The Discharging Capacity of Circular Sewers at Various Inclinations.

IN CUBIC FEET PER MINUTE.

(There are 7.4805 gallons in a cubic foot.)

INCLINATION.				Size, 4 in.	Size, 6 in.	Size, 8 in.	Size, 10 in.	Size, 12 in.	Size, 14 in.	Size, 16 in.	Size, 18 in.	Size, 20 in.	Size, 22 in.	Size, 24 in.
1 in	50, or	105	feet per mile	21.48	60.17	123.5	214	339	474	663	927	....	....	....
1 in	60, or	88	feet per mile	19.73	54.68	112.7	106	310	434	607	849	....	....	....
1 in	70, or	75	feet per mile	18.25	50.37	104.0	182	287	401	561	788	....	....	....
1 in	80, or	66	feet per mile	16.94	46.84	97.02	170	268	375	525	738	....	....	....
1 in	90, or	58	feet per mile	15.89	44.10	91.44	160	252	352	492	696	....	....	....
1 in	100, or	52	feet per mile	15.02	41.75	85.55	152	240	336	470	660	859	1090	1357
1 in	110, or	48	feet per mile	14.23	39.59	82.36	144	228	319	446	630	820	1043	1298
1 in	120, or	44	feet per mile	13.53	37.83	78.52	137	218	305	427	604	785	997	1241
1 in	130, or	40	feet per mile	13.01	36.46	75.38	132	209	292	408	579	755	958	1191
1 in	140, or	37	feet per mile	12.48	34.89	72.59	127	201	281	393	558	728	924	1147
1 in	150, or	35	feet per mile	12.05	33.71	70.15	122	194	271	379	540	702	892	1109
1 in	160, or	33	feet per mile	11.61	32.54	67.71	118	188	263	368	523	680	863	1075
1 in	170, or	31	feet per mile	11.26	31.36	65.61	115	182	254	355	507	661	836	1043
1 in	180, or	29	feet per mile	10.91	30.38	63.52	111	176	246	344	491	641	813	1012
1 in	190, or	27	feet per mile	10.56	29.00	61.77	108	171	240	336	477	624	792	983
1 in	200, or	26	feet per mile	10.36	28.81	60.03	105	167	233	326	464	606	770	958
1 in	250, or	21	feet per mile	....	25.68	53.40	93	148	207	289	413	539	686	854
1 in	500, or	10½	feet per mile	....	....	....	64	102	143	200	286	375	477	593
1 in	750, or	7	feet per mile	....	....	....	....	....	115	160	229	301	382	477
1 in	1000, or	5¼	feet per mile	....	....	....	....	....	....	....	....	257	327	408

A Legal Inch of Water,

At present in California, is the water discharged through an opening one inch square, under a pressure of four inches from the center of the orifice to the top of the water above such orifice, and with a free discharge below. The water flowing through such an orifice is equivalent to 0.02 of a cubic foot per second; 1.20 cubic feet per minute; 72 cubic feet per hour, or 1,728 cubic feet per 24 hours, which in water measurement is called one day. To reduce this to gallons multiply by 7.48, which gives 0.1496 gallons per second, 8.976 gallons per minute, 538.56 gallons per hour, or 12,925.44 gallons per day of 24 hours. As all water measures are first figured in cubic feet per second, and then reduced to legal miner's inches, it is convenient to know that one cubic foot per second equals fifty legal miner's inches.

A Miner's Inch of Water

Is a very indefinite term, and has caused many disputes, as different localities have adopted different heights from the center of orifice to the top of the water, varying from three to eight inches. The great hydraulic companies, however, have agreed upon a six-inch pressure, which gives by actual measurement, as made by Hamilton Smith, at the North Bloomfield, 2260.6 cubic feet per twenty-four hours, or 94 2 cubic feet per hour. In reducing to inches the water stored in reservoirs, the practice is to allow 100 cubic feet per hour. For irrigating heads the pressure runs all the way from three to eight inches among commercial ditches. The latter is, or was recently, in use by the National Canal Company, Sacramento county. That company measures through an orifice four inches deep, with six inches additional to overflow. In regard to the measuring box, the practice is quite uniform. It should be so large that the inflow will not create a perceptible current or commotion. The opening is usually two inches in depth; its length being regulated by a tight-fitting slide, each half-inch being equivalent to an inch of water. The edges are smooth, and if necessary are chamfered on the outside. This system of measurement was first introduced in California by a Mr. John Dunn in January, 1851.

Directions for Laying Sewer Pipe.

Excavation and Inclination.—Commence at the lower end or outlet of the proposed drain or sewer, and make the trench of uniform, gradual and continuous inclination, and as great as attainable.

By distributing the whole available fall over the total length of the drain a much better grade will be secured. A fall of not less than 1 in 40 to 1 in 60 is desirable for pipes of 4 to 6 inches in diameter, and greater if attainable. A grade of 1 in 100 is the least that should be given to small house drains, in order to make them self-cleansing. Larger pipes require less inclination. After bringing the bottom of the trench to a true, uniform grade, cut out special grooves or depressions for the sockets. For the larger sizes of pipe, say all over 8 inches in diameter, excavate a very narrow trench in the middle of the ditch about 6 inches wide, and 3 to 4 inches deep, so that the body of the pipe will rest firmly on the ground. This pipe will sustain the greatest amount of vertical pressure when it has a firm and uniform bearing at every point in its lower surface.

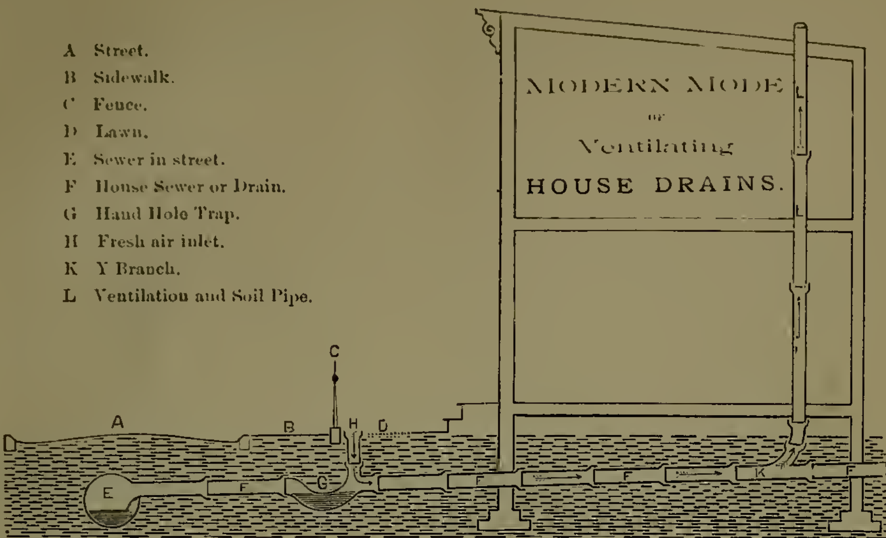
Mode of Laying.—Commence laying the pipe at the outlet with the sockets all facing *up grade*, fair and true to line, and upon foundations of assured stability. Do not lay boards in the bottom of the trench, on which to lay the pipe. The ends of each length of pipe should abut squarely and truly against the adjoining pieces, so as to present an absolute continuity and uniformity in the interior of the drain, particularly at the bottom line. The annular space between the spigot and socket ends of the pipe should be completely filled with hydraulic cement mortar, paying particular attention to the bottom part of the joint, where the mortar should be pressed into it with the fingers.

Cement Mortar.—A cement mortar, good enough for all ordinary use, can be made of one part hydraulic cement (Portland is the best), two parts of clean, sharp sand, free from loam or soil, and fresh made, as wanted for the work on hand. The mortar should be used immediately after being mixed, and not allowed to stand upon the mortar boards until it has set, and then be broken down, re-mixed or re-tempered, so-called. *Never* use any *lime* in the mixture.

Cleaning Pipe.—As the work progresses and each length of pipe is permanently fixed in place, the interior should be thoroughly cleansed and wiped out, and all projecting mortar or other substance carefully removed, so that the internal area of the drain will be left *absolutely unobstructed*, *smooth* and *clean* throughout its entire length, as otherwise the rough projecting points of mortar, when hardened, might catch any waste matter passing through the pipe, and gradually obstruct its discharge. On looking into one end of a drain, a small circular light should be seen at the other end, and if this light is not perfectly circular, it is a sure sign that the pipes have not been properly laid.

Filling.—As fast as the filling is deposited in the trench (sand or fine dirt first), it should be thoroughly puddled and tamped, especially under and around the lower half of the pipe, and to such an extent as to render the subsequent settlement of the surface practically impossible.

Ventilation of Sewers.



Sewers should be ventilated to prevent an accumulation of sewer gas, which is liable to be forced into the houses by drafts of wind or other causes, if precautions are not taken to prevent it.

For ventilating large street sewers, openings carried to the surface at intervals, are probably the best thing yet devised.

For ventilating house drains or sewers, a pipe connecting with the sewer, and carried up through and above the highest point of the roof, with a fresh air inlet between the house and trap will obviate all danger.

As parties have objected to the running trap, and cold air vent, on the line of the main drain, and in some cases have closed up the latter, imagining that injurious effects would result from having them in front of their houses, it would perhaps be well to say something about the advantages to be derived from these modern appliances and the reasons for their adoption.

In order to effect a constant movement and change of air in the pipes, two openings are required, an outlet and an inlet. The extension of the soil pipe through the roof, *affords an escape of the foul air generated in the sewer, by the decomposition of foul organic matter clinging to the inner surface of the pipes.* In order to render harmless this matter undergoing *putrefaction* a *constant introduction* of *pure air* from the *outside* is *absolutely* necessary, and as the soil pipe is warmer (being in the house) than the fresh air pipe, located near the ground in front, the result is an almost constant upward current in the soil pipe.

This has been found to be the case even with the soil pipe on the outside of the house, for the reason that it is heated more by the sun, than the fresh air pipe near the ground.

Most persons are familiar with the running trap, which is practically a bend in the drain, holding a sufficient quantity of water to prevent the passage of air or sewer gas from the street sewer to the house drain. This, in conjunction with the cold air vent, gives perfect security against the public sewer.

"What is known under the general term 'sewer gas,' *is* the emanation from waste matters undergoing decomposition in the absence of free air and light and in the presence of water, whether in a sewer, house drain, cesspool, vault, or a foul, wet and *unventilated* cellar. It frequently exists in the case of a detached country house, and is never absent from a town sewer, though it is possible in the case of these, by perfect *ventilation*, greatly to lessen its production, and so to dilute it as to prevent its doing serious harm."

Intermittent Flush-Tanks.

Introduction.

With the construction of separate sewerage systems in this country, beginning with Memphis about ten years ago, and the invention by Rogers Field of an automatic siphon having no moving parts, a new era in sewer building was introduced.

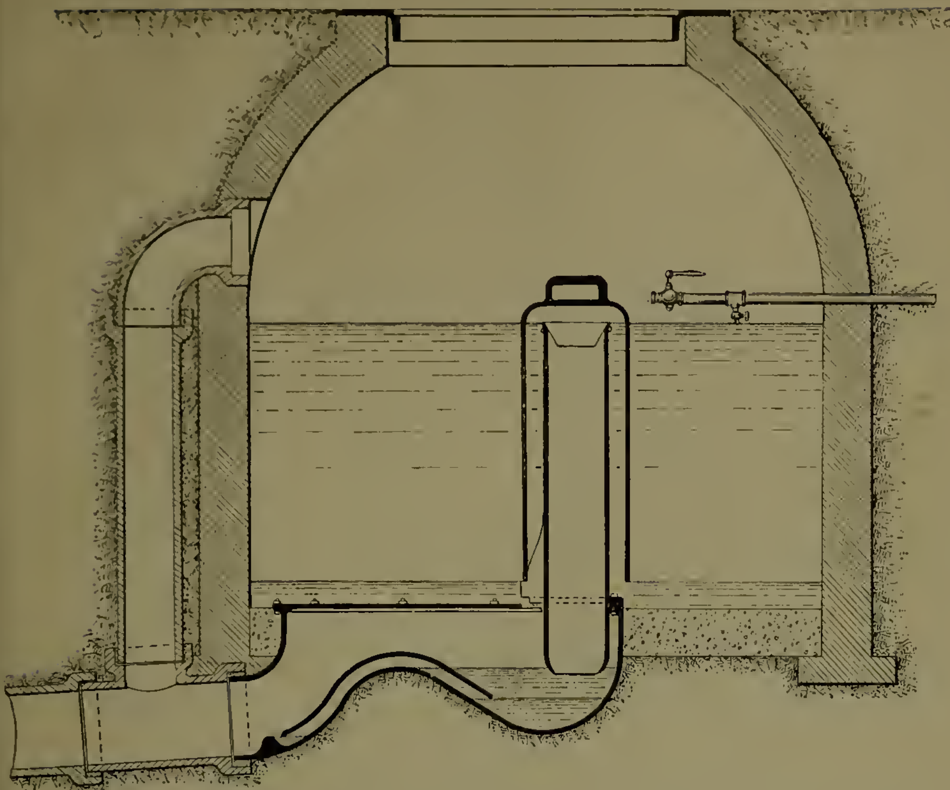
A radiating system of underground conduits, built mainly of smooth clay pipes, their upper extremities flushed at regular and frequent intervals, has afforded an object lesson in sanitary practice, so nearly approaching perfection, that the adaptive mind of American engineers has been quick to extend it to the whole field of sewer building.

At first, automatic flush-tanks were looked upon as scarcely more than ingenious toys, or at best, as contrivances, which, though of theoretical beauty, were of doubtful practical value. Now their utility is so well established, that no progressive engineer thinks of designing a separate system, or partly separate system of sewers, without their liberal use; while some are using them upon combined systems. That they have not been used more generally upon combined systems, is largely due to the fact that until within the last few months, no siphon operated by a very small stream of water and discharging a sufficient volume to flush large sized pipes has been upon the market, and partly to the fact that in some places the officers in charge of sewers object to the use of the necessary amount of water. We are now enabled to furnish flush-tanks of any size which will discharge, with a certainty and rapidity proportioned to their capacity however small the stream of water supplying them, thus making it possible by the most economical use of water to flush even brick sewers several feet in diameter.

Col. Geo. E. Waring, Jr., in his work on "Sewage and Land Drainage," says: "It is first of all important to maintain, at least for a short time each day through every portion of the sewerage system, a living stream of sufficient depth and velocity to remove objects which sewers are constructed to receive, and which would be stranded if introduced with too small a volume of water to keep them moving; or deposited if the stream is too sluggish. Objects so stranded, whatever their character, are liable to become sources of local accumulation, not necessarily nor generally to the extent of constituting a positive obstruction of the sewer, but sufficient to establish a seat of decomposition and to give rise to the fœtid cesspool odor, sewer gas, which should be considered inadmissible."

There is no practicable way to fulfill these conditions but by the use of flush-tanks. In all parts of the United States rains are so infrequent during some parts of the year that even if roof water is freely admitted to the sewers it will not suffice to keep them in a sanitary condition. The deposits made in sewers where street water is admitted are more difficult to remove than any other kind of obstruction, and where such sewers have slight grades they become exceedingly filthy by the combined deposits from house and street. The occasional flushing which they receive in some cities serves at best to prevent them from becoming entirely clogged, the improvement of their sanitary condition being of the most temporary nature. The only permanent remedy for such evils is frequent flushing at regular intervals, which can alone be secured successfully by the use of automatic flush-tanks.

FIELD-WARING FLUSH-TANK.



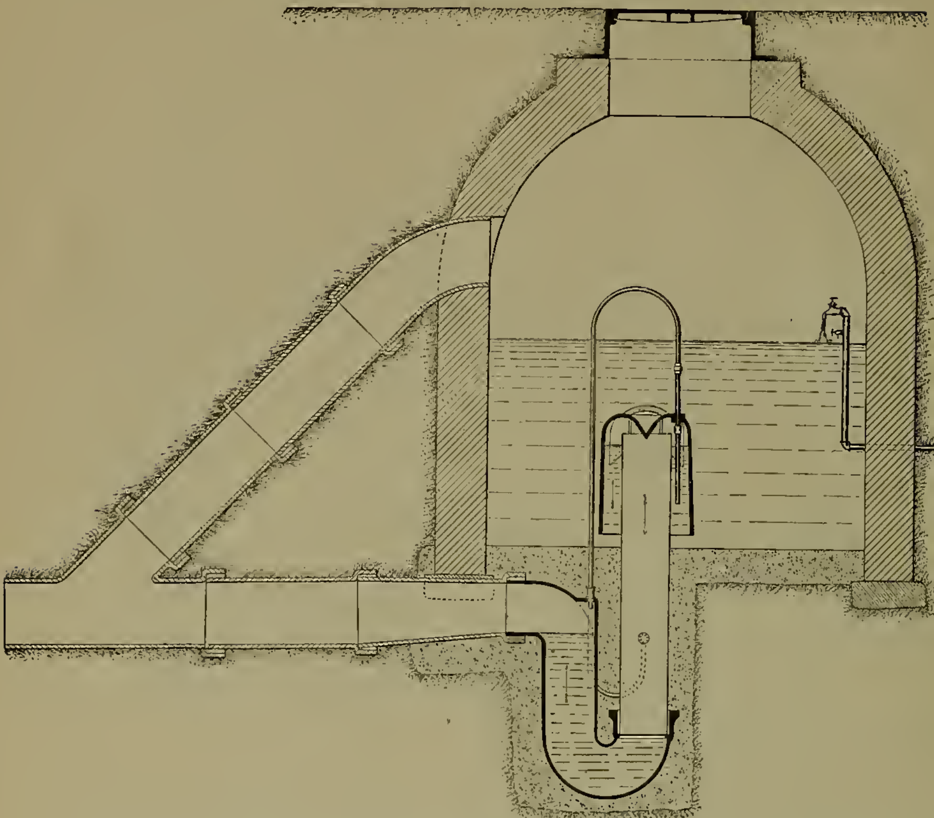
The siphon invented and patented by Rogers Field and improved by Col. George E. Waring, Jr., consists (in the form shown) of an annular intaking limb, and a discharging limb at the top of which is an annular lip or mouth-piece, the bottom of which is tapered to less diameter. The discharging limb terminates in a weir chamber which when full to its overflow point just seals the limb. Over the crest of the weir is a small siphon whose function is to draw the water from the weir chamber and thus unseal the siphon. At the lower end of the small siphon is a dam or obstruction to prevent its breaking. The main siphon is brought into action (on the tank being filled) by means of a small stream of water flowing over the annular mouth-piece and falling free of the sides of the discharging limb. As soon as the lower end of the discharging limb has been sealed by filling the weir chamber the falling stream of water gathers up and carries out with it a portion of the contained air, thus producing a slight rarefaction. This rarefaction causes the water to rise in the intaking limb higher than in the basin outside, and hence increases the stream of water flowing over the mouth-piece, which in turn increases the rarefaction, and the siphon is soon brought into full play.

On the tank being emptied to the bottom of the intaking limb the flow is checked, and the small siphon over the crest of the weir draws the water from the weir chamber, air enters the discharging limb, and the siphon is vented ready for the tank to again fill.

Table of Dimensions, with Prices of Field-Waring Siphons.

Diameter of Discharging Limb.	Diameter of Sewer.	Price of Siphons.
4½ inches.	6 inches.	$40 00
6 inches.	8 inches.	50 00

RHOADES-WILLIAMS FLUSH-TANK.



The Rhoades-Williams siphon as illustrated, consists of an annular intaking limb, and a discharging limb terminating in a deep trap below the level of the sewer. Below the permanent water line in the discharging limb, is connected one end of a small blow-off or relief-trap, having a less depth of seal than the main trap, the other end of which joins the main trap on the opposite side, at its entrance to the sewer and above the water line of the trap. At the same point is connected an upright vent pipe which rises through the tank to a point above the high water line, and is turned down through the top of, and into the intaking limb of the siphon, terminating at a given point above its bottom.

As the tank fills with water (the main and blow-off traps being full), it rises in the intaking limb even with the level of the water in the tank until reaching the end of the vent pipe, a volume of air is confined in the two limbs of the siphon between the water in the intaking limb and the water in the main trap. As the water rises higher in the tank the confined volume of air is compressed, and the water is depressed in the main trap and in the blow-off trap. This process goes on until the water in the tank reaches its highest level above the top of the intaking limb, at which time the water is depressed in the blow-off trap to the lowest point and the confined air breaks through the seal, carrying the water with it out of the trap, thus releasing the confined air and allowing an inflow from the tank, putting the siphon into operation.

On the tank being discharged to the bottom of the intaking limb, the flow is checked, and the siphon is vented by the admission of air to it through the vent pipe.

The blow-off trap connects with the discharging limb by means of a perforated brass strainer projecting slightly on the interior of the siphon where it is thoroughly washed by the current, thus preventing any possible obstruction of the same.

Price and Capacity of Tanks.

In the following table will be found the size and price of standard siphons made by us under the Rhoades and Williams patents, the size of sewer which they will flush under normal conditions, the amount of water necessary to fill about 100 lineal feet of sewer of the given size, and the diameter and discharging capacity of circular tanks using siphons of standard length. With a given sized siphon the tank itself may be made of any diameter, and on special order being given, the depth of water discharged by the tank may be increased to any extent. The depth of discharge may be diminished by lengthening the small vent pipe inside the annular intaking limb of the siphon, provided that it is not extended nearer than about 1½ inches of the bottom of the limb.

Where the depth of the sewer to be flushed will admit of it, the rate of discharge may be increased materially by lengthening the siphon, and a given sized siphon may be made adequate for a sewer of greater diameter than the corresponding diameter in the table, and the amount of water discharged may be increased without increasing the size of the tank. Siphons of larger size than those listed will be made on special order.

Where rock, or troublesome quicksand generally prevails, rendering it important that no portion of the siphon should be set lower than the sewer, we can on special order furnish siphons no part of which will be placed lower than the sewer.

Table of Dimensions, with Prices of Rhoades-Williams Siphons.

Diameter of Discharging Limb. Inches.	Diameter of Sewer. Inches.	Size and capacity of Tanks, with Siphons of Standard Length.			Water required to fill 100 Lineal Feet of Sewer. Cubic Feet.	Price for Siphons of Standard Length.	Price for each Additional Foot in Length of Siphon or part thereof.
		Diameter. Feet.	Discharging Depth. Inches.	Discharging Capacity. Cubic Feet.			
5	6	4	26	27	20	$40 00	$ 5 00
6	8	4½	31	40	35	50 00	6 00
8	10	5	36	59	55	75 00	8 00
10	12	6	36	85	79	100 00	10 00

Directions for Building Flush-Tanks.

The discharging limb of each siphon should be set in a vertical position, and the earth and concrete thoroughly consolidated about the siphon. In building the basin great care should be exercised to make it water tight, by being thoroughly plastered on the inside. Nothing but the best hydraulic cement (Portland if possible) should be used. The feed should be brought into the tank at sufficient depth below the ground to keep it from freezing and it should be turned up free of the wall inside the tank. It is best to provide a small pet cock for the regular supply, and a large cock for special use, by which to fill the tank rapidly. Tanks should be provided with a tight-fitting cover, and should be connected with the sewer above the water line to keep them from freezing.

This upper connection with the sewer should be put in full size of sewer in such manner as to answer for inspection purposes.

We are the Sole Agents on the Pacific Coast for these Flush-Tank Siphons.

Gladding, McBean & Co.

Vitrified Salt Glazed

We manufacture this pipe expressly for the purpose of conducting water, where the pressure is not greater than a head of twenty-five feet. It has come into extensive use for that purpose within the past few years, and in a great measure is taking the place of iron pipe, on account of its non-liability to corrode, or be affected by alkali or mineral waters.

The pipe is made in two-foot lengths, with sockets, and out of the best prepared stone-ware clay, and pressed into shape by powerful machinery. The pipe is made very compact, and is thoroughly vitrified by being fired at a high temperature.

In laying this pipe the ends of each length must abut squarely and truly against the adjoining pieces, so that the annular space between the spigot and socket ends of the pipe will be the same at all parts of its circle.

This annular space must be completely and thoroughly filled with a mortar made of the best English Portland cement, and clean, sharp sand (free from loam or pebbles), mixed in equal parts, and used as soon as mixed. From eight to ten days' time should be allowed for the cement to thoroughly harden before the pipe is covered or water is allowed to pass through it.

Water should not be turned off at the outlet, but at the inlet or point of supply.

Place on the line of pipe a stand pipe, with a removable cap, so that it can be used, when desired, as an air escape.

If the above directions are strictly adhered to, the Pipe will stand a pressure or head of twenty-five feet.

NOTICE.—See fuller directions for laying pipe on page 16.

Price List of Water Pipe.

Caliber of Pipe.	Price of Pipe per Foot.	Branches, Each.	Curves and Elbows, Each.	Reducers or Increasers.	Weight of Pipe per Foot.	Feet to Carload of 10 Tons.
3 inch	$0 15	$0 60	$0 50	....	6½ lbs.	3000
4 inch	20	80	60	$0 60	9 lbs.	2200
5 inch	25	1 00	75	75	13 lbs.	1540
6 inch	30	1 20	1 00	90	16 lbs.	1250
8 inch	40	1 60	1 50	1 20	22 lbs.	900
10 inch	60	2 40	2 10	1 80	31 lbs.	650
12 inch	75	3 00	2 75	2 25	41 lbs.	490
14 inch	1 00	4 00	3 75	3 00	50 lbs.	400
16 inch	1 25	5 00	4 25	3 75	66 lbs.	300
18 inch	1 50	6 00	4 75	4 50	80 lbs.	250
20 inch	1 75	7 00	5 75	5 25	90 lbs.	220
22 inch	2 10	8 40	7 00	6 30	105 lbs.	190
24 inch	2 50	10 00	8 00	7 50	120 lbs.	170

Special Prices Quoted on Carload Lots.

See Tables on Pages 14 and 15.

Well Tubing.

With Sockets.

(For Prices see Pages 5 and 7.)

Without Sockets.

Within the past few years Vitrified Pipes have come into very general use for tubing bored wells, and they are certainly the cleanest and most durable materials ever used for that purpose. Where there is no stone to obstruct the boring, wells can be easily and cheaply made, with augers similar to post augers, constructed for the purpose, and such wells, when lined with this stone-ware tubing, are superior to any others in point of cleanliness and durability.

For this use the sections are sometimes made without sockets, so as to fit the hole more closely, but the regular socket joint is by far the best, as this makes a more solid joint, each piece fitting accurately into the end of the next, thus forming a continuous tube, leaving no crevice for the dirt to fall in, doing away with the necessity of cleaning the well. Vermin cannot crawl through the joints and fall in; hence, sweet, pure water is the result.

Dug wells are curbed with the larger sizes and are far superior to a curbing of brick or stone, especially in sandy ground, where common wells are easily made, and when made are constantly filling up with quicksand; but with these pipes a well can be put down with ease, even in a bank of quicksand. This is best done by a man getting inside the pipe, and as he throws out the sand the pipes settle down by their own weight. When the first pipe gets below the surface put on another, and so continue to do until the required depth is reached.

Our second-class pipe is well adapted for this purpose.

Culvert Pipe.

(For Prices see Pages 5 and 7.)

Stone-ware pipes are extensively used for *railroad culverts*, and have been for the last twenty years, and we desire to call the attention of *county road commissioners*, *supervisors* and *overseers of common wagon roads* throughout the country, to the use of these pipes for *culverts across common roads*, in place of all small plank bridges and box culverts, so common in country roads, and which are constantly getting out of repair, and last at most but a few years; whereas, a stone-ware pipe culvert will last for ages without any repairs whatever, if well put in, and will prove cheapest in the long run, as well as best.

The construction of a pipe culvert is a very simple matter, but should nevertheless be done with care. If the top of the pipe, when laid, is less than two feet below the surface

of the road-bed, first cover the pipes with dirt to the depth of a few inches and level it off, then place a few poles, fence rails or planks over the pipes lengthwise, and throw on more dirt and grade up to the level of the road-bed. The rails or poles will serve to equalize the pressure on the pipes when the wheels of heavy wagons pass over them; but if the dirt is two feet deep or more no other protection is necessary. The ends of the culvert should be protected by small abutments of stone or plank (as shown), otherwise the end pipes would be liable to be undermined by the action of the water, or displaced by thirsty hogs in search of water to drink or wallow in. The size of pipe required in each particular case depends of course upon the amount of water to be provided for, and this depends upon the area of ground from which the rainfall runs to the culvert. This area can generally be estimated with sufficient accuracy, by careful observation, without surveying instruments, and the size required can then be determined by reference to tables on the previous pages. When there is any doubt as to the proper size it is better, of course, to put in one larger than is necessary rather than too small.

We have had few calls for pipes as small as six inches for this purpose, but the sizes most used range from 8 to 18 inches for turnpikes, wagon roads, plantation culverts and street crossings, and from 12 to 24 inches for railroads. Our second-class pipe is well adapted for this purpose.

Fig. 12.

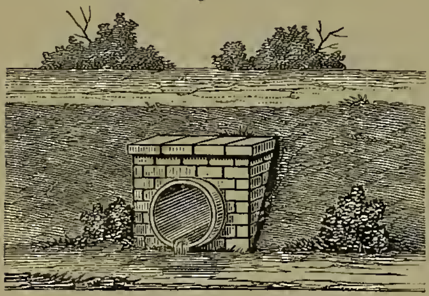


Fig. 13.

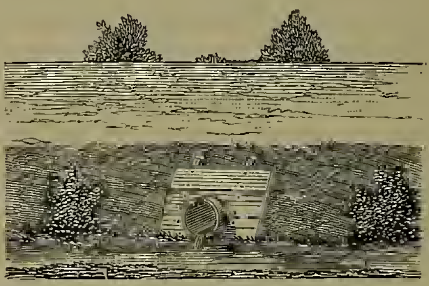


Figure 12 shows the end of a pipe culvert, protected by a small abutment of stone or brick. The foundation should of course extend far enough down into the ground to be below the influence of frost, as otherwise the alternate heaving and settling might throw the end pipe out of position. When stone or brick abutments are too expensive, a good and cheap substitute can be made of planks, by setting them on end, deep enough in the ground to hold them in place, and fitting them closely about the pipe; or still better by setting a post each side of the pipe (see Fig. 13), and by spiking the planks on horizontally, as represented above.

When planks or posts are used it is best to set them with considerable inclination toward the road-bed to prevent the pressure of the embankment from crowding the planks outward.

Orders promptly attended to, and shipments made to all points accessible by water or railroad.

DRAIN TILE

DESCRIPTION.

Your attention is called to our **Vitrified Tile**, which are extensively used on this coast for the **Drainage or Sub-Irrigation** of lands.

Our Tile are manufactured without sockets or collars, in one foot lengths, and are laid in the trench with their ends joined as closely as possible. If to be used for **Drainage**, the water will enter where the ends of the tile meet, and if for **Irrigation**, it will escape at the same points.

We take it for granted that a few suggestions as to the form and quality of tile best suited to the purpose may not be out of place. First as to form—the round tiles are undoubtedly the best, because they can be laid any side up, and thus a close joint can be secured with much less trouble than with flat bottom or horse shoe tile, especially if a little out of shape. It is not well to use those which have been drawn out of shape by excessive heat in burning.

As to quality, tile should be made of good fire-clay, and hard burned—the more like stone-ware the better. Such tile are of unusual strength, which materially reduces the breakage and expense of transportation.

Too much stress cannot be laid upon the importance of using *hard burnt tile only*, as the failure of a single tile may work extensive mischief.

Tile should be smooth on the inside, as the friction will be less.

The old-fashioned notion that drain tile should be porous in order to absorb the water was an error. The water enters the drain at the joints, and nowhere else to any appreciable extent.

The tile made of common brick clay at various places throughout the country, is a good deal better than nothing; but when good, solid, hard-burned tile made of fire-clay, can be obtained at about the same price, it is a great mistake to use the soft porous tile. The farmer cannot afford to use inferior tile; he wants only what is reliable, and will be of permanent value.

WE CLAIM ALL THE ABOVE ADVANTAGES FOR OUR TILE.

Practical Suggestions for the Laying of Tile Drains.

In the beginning of drainage the work should be carefully laid out, the inclination marked on grade stakes, and the whole should be platted and carefully preserved for future reference. If it is not possible to complete the work soon, let it be so done as to look forward to the time when it shall be completed.

In laying a tile drain, it is well to strictly adhere to the following rules:

1. The drain should have a sufficient outlet for the discharge of all the water that may pass through it.

2. The drain should be deep enough to drain the widest space possible—from three to four feet—and deeper, if necessary to get the water out by a much shorter line: but drain any way, even if you cannot get an outlet to drain so deep.

3. The bottom of the drain should be one regular line of descent, so that the current may have a smooth flow from the head to the mouth of the drain.

4. Every tile should be perfect in form and well burned, having a clear metallic ring.

5. In laying the tile, take pains to fit the joints closely, as with all care there will be sufficient space for the inlet of the water, and close joints will prevent the letting in of silt or washings.

6. At the junction of drains the water should be brought together, flowing as nearly as possible in the same direction, so that the flow of the current may not be obstructed.

7. Place a coarse sieve, or something of that kind, across the outlet, to prevent rats or snakes from crawling in.

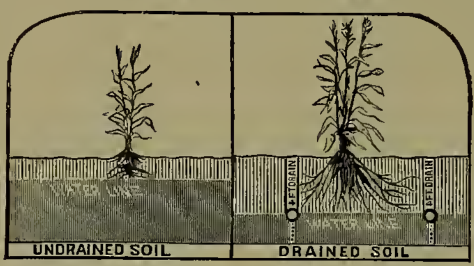
8. The size of the tile may be pretty accurately determined by the amount of surface to be drained and the descent of the drain, by reference to the tables on page 28.

9. At the point where the work ceases for the time, secure and note the same, that the work may be readily taken up at any future time.

10. If the drains be laid at a distance of 40 feet apart, 1,060 feet of tile are required to lay one acre; if at a distance of 50 feet apart, 860 feet will be required, and at a distance of 60 feet apart, 750 feet.

11. Smaller tile than three inches in diameter should not be used, and drains constructed with tile of that size should not exceed one thousand feet in length.

The Effects of Drainage.



Drought.

DROUGHT. — "It is often asked, 'If draining makes a soil dry in a wet year will it not make it too dry in a dry time?' It has been shown that a drained soil holds a large quantity of moisture by absorption. The soil being very much deepened, the roots of plants have access to the moisture contained in a much larger mass of soil than when undrained. Again, a soil is filled with capillary tubes, which carry moisture to the surface, where it is quickly converted into vapor. If the surface is mellow and the whole depth of soil loose, the tubes are much larger, so that water is conveyed to the surface in much less quantities. Consequently less moisture is lost by evaporation. Still further, in dry times the soil below the surface is much cooler than the air, hence, when air containing vapor is brought in contact with it, the vapor is condensed into water and absorbed by the particles of soil. In an undrained soil the surface is made compact by standing water, is baked by the sun when the water is evaporated, is compact below, giving little depth of soil for the plants. Moisture evaporates rapidly through the hard surface, and roots, having a comparatively small range, soon feel the ill effects of dry weather. Some soils are naturally very rich and porous, producing good crops when the spring rains are light enough to allow the soil to be worked, but it has been found that such soil produces much larger crops even in dry times when well drained. In short, thorough under-draining has been found to be a most efficient preventive of drought. It also makes a better tillage possible, which in itself is a great advantage, and it makes all parts of the soil available for the use of useful crops."

Ten Reasons why Farmers should use Drain Tile.

1. Thorough drainage deepens the soil.
2. Allows pulverization.
3. Prevents surface washing.
4. Lengthens the season for labor and vegetation.
5. Prevents drought.
6. Warms the soil.
7. Supplies air to the roots.
8. Promotes absorption of fertilizing substance from the air.
9. Improves the quality of crops.
10. Increases production.

☞ If you contemplate drainage, write to us for a copy of C. G. Elliott's work on "Practical Farm Drainage."

Drain Tile and Fittings.

Price List.

Inside Diameter of Tile.	Price of Tile per 1,000 feet.	Price of Branch's, each.	Price of Curves, each.	Price of Reducers, each.	Weight of Tile, per Foot.	Feet to Carload of 10 tons.
2 inch	$25 00	$0 25	$0 25	$0 25	2½ lbs.	8,000
3 inch	30 00	35	35	35	3½ lbs.	5,750
4 inch	40 00	40	40	40	5½ lbs.	3,630
5 inch	60 00	50	50	50	8 lbs.	2,500
6 inch	90 00	60	60	60	10 lbs.	2,000
8 inch	150 00	75	75	75	18 lbs.	1,100
10 inch	250 00	1 00	1 00	1 00	21 lbs.	950
12 inch	300 00	1 25	1 25	1 25	29 lbs.	700

Special prices quoted on carload lots shipped from Lincoln to any part of the Coast.

Tile ordered by the carload will be subject not only to a special price, but a special rate of freight as well.

See valuable tables on the next page.

Capacity of Drain Tile.

The following table may be found convenient for reference by those who are considering the subject of drainage:

Number of Acres which Tiles, of the following Sizes and Inclinations will Drain, when the Rainfall does not exceed Half an Inch in Twenty-four Hours.

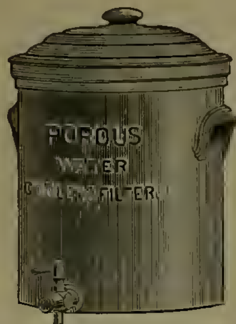
INCLINATION.	2 Inch Tile.	3 Inch Tile.	4 Inch Tile.	5 Inch Tile.	6 Inch Tile.	8 Inch Tile.	10 Inch Tile.	12 Inch Tile.
1 foot in 10 feet	6.6	18.9	......	......	......	......	......	......
1 " 20 "	4.7	13.	26.8	47.2	......	......	......	......
1 " 25 "	4.2	11.4	24.	44.4	66.2	......	......	......
1 " 30 "	3.9	10.9	21.9	41.2	61.5	126.4	......	......
1 " 40 "	3.4	9.4	19.	36.1	53.3	109 6	190.5	......
1 " 50 "	3.	8.4	17.	30.4	47.7	98.	170.4	269.
1 " 60 "	2.7	7.6	15.6	29.1	43.4	90.	156.	246.
1 " 70 "	2.5	6.9	14.5	26.5	39.9	83.	144.4	228.1
1 " 80 "	2.3	6.5	13.4	23.6	37.2	77.	135.	213.
1 " 90 "	2.2	6.1	12.6	23.1	35.	72.5	127.	200.5
1 " 100 "	2.	5.7	11.9	21.2	33.1	69.2	120.6	190.5
1 " 150 "	1.6	4.5	9.5	19.2	26.6	56.	97.3	154.4
1 " 200 "	......	3.9	8.2	15.2	22.8	48.	83.9	132.5
1 " 250 "	......	3.5	7.5	13.4	20.4	43.4	74.4	117.
1 " 300 "	......	......	6.9	12.3	18.4	38.2	65.5	107.
1 " 400 "	......	......	5.9	10.6	16.5	34.6	60.3	90.7
1 " 500 "	......	......	5.3	9.6	14.8	30.1	54.	81.6
1 " 600 "	......	......	4.8	9.	13.3	28.	48.6	74.
1 " 800 "	......	......	4.1	7.6	11.4	24.	41.9	65.
1 " 1,000 "	......	......	......	6.7	10.2	21.2	37.2	56.
1 " 1,500 "	......	......	......	......	8.7	17.6	30.8	47.
1 " 2,000 "	......	......	......	......	......	......	27.	40.8

NOTE.—One acre covered with water one-half inch in depth, is equivalent to 1,815 cubic feet, or 13,577 gallons. The capacity of the tile can be expressed in cubic feet or gallons by multiplying the number of acres drained by either 1,815 or 13,577.

Table Showing the Quantity of Rainfall per Acre.

Inches in Depth of Rain.	Cubic Feet per Acre.	Gallons per Acre.	Inches in Depth of Rain.	Cubic Feet per Acre.	Gallons per Acre.
.1	363	2,715	.6	2,178	16,292
.15	544½	4,073	.65	2,359½	17,650
.2	726	5,430	.7	2,541	19,007
.25	907½	6,788	.75	2,722½	20,365
.3	1,089	8,146	.8	2,904	21,723
.35	1,270½	9,503	.85	3,085½	23,081
.4	1,452	10,861	.9	3,267	24,438
.45	1,633½	12,219	.95	3,448½	25,769
.5	1,815	13,577	1.0	3,630	27,154
.55	1,996½	14,934			

Porous Terra Cotta Water Cooler and Filter.



Price each, $2.00.

We call the attention of the trade to our **5-Gallon Water Cooler,** which may also be used as a filter where the water is not clear or free from impurities, by placing a couple of inches of clear gravel or pebbles on the perforated strainer, near the bottom of the cooler.

In extremely hot weather it is well to cover the outside of the vessel with some coarse cloth (a grain sack will answer the purpose), which will keep damp by the moisture, which passes through the porous body to the exterior surface.

Soak the wooden faucet before inserting it; if this is not done it will be liable to swell, and crack the cooler.

When the gravel accumulates sediment, take it out, cleanse and replace.

☞ Keep in a shady place.

Acid Receivers.

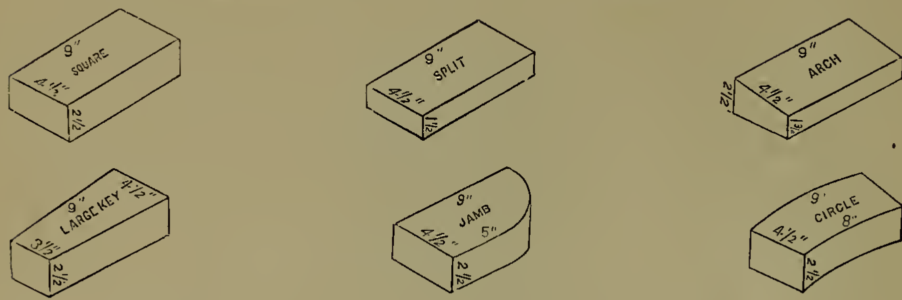
*Acid Receivers, per gallon............ .. ..$

Faucets, each . ...

* Price according to capacity and number ordered.

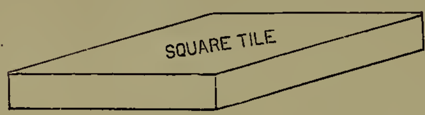
FIRE BRICK.

Recent additions and improvements in our FIRE BRICK Department, enable us to supply the trade with the best quality of all standard sizes and styles of Fire Brick and Tile, at the lowest market prices.



Square.	Per 1000, *$		Key.	Per 1000, *$............	
Split.	Per 1000, ...		Jamb.	Per 1000, ...	
Arch.	Per 1000, ...		Circle.	Per 1000, ...	

FIRE TILE.



Form.	Dimensions.	Price each.	Form.	Dimensions.	Price each.	Form.	Dimensions.	Price each.
Square edge.	8x 8x2 in.	*$	Square edge	12x 6x2 in.	*$	Square edge	24x12x3 in.	*$
Square edge.	10x10x2 in.		Square edge	14x 6x2 in.		Square edge	24x15x3 in.	
Square edge.	12x12x2 in.		Square edge	16x 6x2 in.		Square edge	28x12x3 in.	
Square edge.	14x14x2 in.		Square edge	18x 6x2 in.		Square edge	18x 6x6 in.	
Square edge.	16x16x2 in.		Square edge	24x12x2 in.		Square edge	24x 6x6 in.	
Square edge.	18x18x2 in.		Square edge	20x15x3 in.				

Form.	Dimensions.	Price each.	Form.	Dimensions.	Price each.	Form.	Dimensions.	Price each.
Flanged edge	24x12x3 in.	*$	Flanged edge	28x12x3 in.	*$	Flanged edge	30x15x3 in.	*$
Flanged edge	24x15x3 in.		Flanged edge	28x15x3 in.		Flanged edge	36x15x3 in.	

Any size or shape not given can be made to order at short notice.

FIRE CLAY.

Crude, in bulk, per ton ....*$........	Finely ground, in sacks of 150 lbs......*$........
Finely ground, in bulk, per ton.....	Fire Brick Dust, in sacks of 150 lbs ....

When the ground clay is furnished in carload lots, sacked, we charge the market price for the sacks, unless they are returned to us in good condition.

* Price, according to quantity and point of delivery.

☞ When requesting figures, please state quantity required.

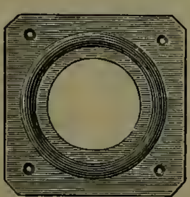
Terra Cotta Thimbles.

These terra cotta thimbles are very strong and durable, and are used for forming the stove pipe holes in brick chimneys, etc. They do not contract or expand, and cause cracking in the plaster, as is often the case when metal thimbles are used.

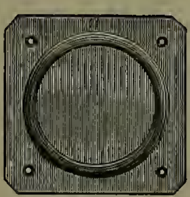
Price List of Thimbles.

Diameter.	4½ Inches Long.	6 Inches Long.	8 Inches Long.	10 Inches Long.	12 Inches Long.
4 inches.	15 cents.	20 cents.			
5 "	20 "	25 "	30 cents.	35 cents.	40 cents.
5½ "	20 "	25 "	30 "	35 "	40 "
6 "	25 "	30 "	35 "	40 "	45 "
7 "	30 "	35 "	40 "	45 "	50 "
8 "	35 "	40 "	45 "	50 "	55 "

Terra Cotta Starting Plates.



With Hole.



Solid.

Price List of Starting Plates.

10 x 10 inch, for supporting 5-inch chimney pipe, either with hole or solid, price 40 cents.
12 x 12 " " " 6 " " " " " " " " 50 "
14 x 14 " " " 8 " " " " " " " " 60 "

Terra Cotta Chimney Pipe.

We take pleasure in introducing our improved Terra Cotta Chimney Pipe. They have come into very general use within the last few years, especially where bricks are not plenty or cheap, and they have given entire satisfaction. Among the advantages are:

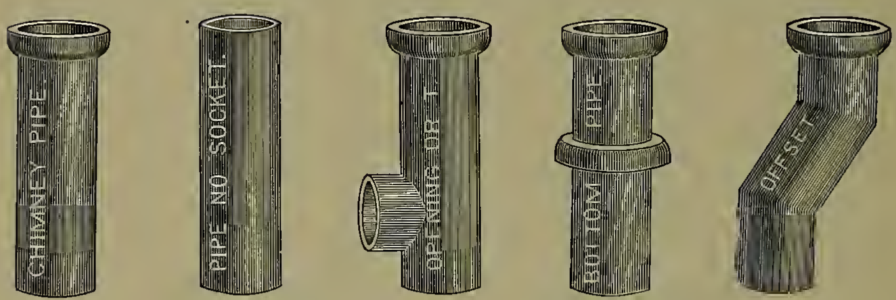
1st. They are made of the best prepared Fire Clay, a portion of which is calcined, and they do not contract and expand by heat and cold, thus making the most durable and perfect chimney flue known.

2d. They are cheaper than brick by one-half.

3d. They are smooth, and soot does not stick to them, as in the case with brick flues. In fact, pipes make a more perfect chimney than bricks, a smooth round bore being the best possible form for a smoke flue.

4th. They are safer than brick flues. By referring to the illustration it will be seen that by filling the socket with cement, it will form a solid flue from starting point to roof. They do not require a mechanic to put them up, but can be erected by a person of ordinary intelligence. *Care should be taken to fill the socket with cement or mortar, as upon that depends its safety.* They are very much lighter than brick (weight of six-inch pipe is only seventeen pounds per foot); need no foundation or support, and do not spring the joists. All lengths are made two feet, unless otherwise ordered.

Chimney Pipe and Fittings.



Price List of Chimney Pipe and Fittings.

Caliber of Pipe.	Price of Pipe per Foot, with or without Sockets.	Openings or T's, Each.	Bottom Pipe, Each.	Elbows, Each.	Offsets, Each.	Weight of Pipe, per Foot.
5 inch.	25 cents.	$1.00	$1.00	$0.75	$1.25	14 lbs.
6 inch.	30 cents.	1.20	1.20	1.00	1.50	17 lbs.
8 inch.	40 cents.	1.60	1.60	1.50	2.00	23 lbs.

NOTE.—Our Chimney Pipe, Openings and Bottom Pipes are furnished in two-foot lengths. Shorter or longer lengths (up to four feet), and larger sizes can be furnished on short notice.

See illustration of an Elbow, Fig. 4, page 4.
See directions for erecting our Pipe Chimneys, on pages 34 and 35.

Terra Cotta Flue Linings.

At the East very few first-class houses, either public or private, are now built without Terra Cotta flue linings, either round or square (round is the best for draught) for each smoke flue in the chimneys, thus effectually protecting the buildings against fires. Our flues are made of the best fire clay. They cannot rust or decay; do not choke up or burn out; are non-conductors of heat; make a smooth, continuous flue, with good draught, and avoid dangers caused by defective flues. A brick chimney, as ordinarily constructed, has on the inside a thin coating of lime mortar to make it smooth. In a few years the action of the heat and gases from coal cause the mortar lining and mortar in the joints to fall off, especially when the soot in the chimney burns out, then there remains a small opening in the brick work, through which there is always a draught. The heat from the chimney passes through this hole, and sets fire to the adjacent wood-work. This is the origin of fires from defective flues, from which cause not less than twenty-five per cent. of our fires occur.

These flue linings are also very generally used for hot air flues for conducting the heat from furnaces to the several rooms in the house, being much superior to tin for this purpose, as they cannot rust or communicate fire to the wood-work through which they pass.

Insurance companies recognize the additional safety secured by the use of these flue linings, by insuring buildings thus protected at lower rates than they otherwise would.

These goods commend themselves to all who examine them, and have grown into favor very rapidly in the past few years. Several cities have ordinances compelling their use in all new buildings, and there can be little doubt that such a policy will become general so soon as their utility shall become generally understood.

Round and Square Flue Linings.

Price List of Flue Linings and Fittings.

Inside Measure.	Outside Measure.	Form.	Price, per Foot.	T's, each.	Weight, per Foot	Feet to carload of 10 tons:
5 inches.	7 inches.	Round	25 cents.	$1.00	12 lbs.	1670
6 inches.	8 inches.	Round	30 cents.	1.20	14 lbs.	1430
8 inches.	10 inches.	Round	40 cents.	1.60	18 lbs.	1120
10 inches.	12½ inches.	Round	60 cents.	2.40	25 lbs.	800
7 x 7 inches.	8½ x 8½ inches.	Square	35 cents.	1.40	19 lbs.	1060
7 x 11½ inches.	8½ x 13 inches.	Square	60 cents.	2.40	24 lbs.	835
7 x 15½ inches.	8½ x 17 inches.	Square	75 cents.	3.00	30 lbs.	670
11½ x 11½ inches.	13 x 13 inches.	Square	75 cents.	3.00	30 lbs.	670

A charge of one foot additional will be made for pipe holes.

Directions for Erecting Terra Cotta Pipe Chimneys.

[For Illustration, see page 36.]

Mode of Erecting.—The pipes should be set with their socket ends up (more especially for inside work), as this gives the best opportunity of making the joints tight, and prevents the mortar from dropping out. Especial care should be taken to completely fill the annular space between the spigot and socket ends of the pipe with mortar, as upon that depends the chimney's safety. Carefully remove from inside of the pipe all projecting mortar before it hardens. Where joints are made above the roof, as illustrated in chimney 2, or when chimneys are erected on the outside of a building, great care should be taken to properly fill the joints with hydraulic cement mortar, and slope the cement filling from the pipe to outside of socket, so that the water will drain off and not enter the chimney through any defective filling.

In districts where considerable rain falls, it might be advisable where chimneys are erected on the outside of a building, to reverse or erect with the sockets down, as illustrated in chimney 1. This will certainly prevent water from entering at the joints, even should the mortar and workmanship be poor.

These chimneys can be inclosed, with lath and plaster, or other materials, the same as a flue of brick.

Size of Pipe.—The five-inch pipe is mostly used for parlor and other small stoves; the six-inch for ranges, stoves and ordinary sized fire-places; the eight-inch for extra large fire-places (such as used in country houses), or where more than one stove is to be connected with the chimney; also for small furnaces. Any chimney will give better satisfaction if only one stove is connected with it.

We keep in stock at all times, the 5, 6 and 8-inch, with the necessary fittings, and frequently have on hand 10 and 12-inch, and can make any size up to 24-inch on short notice.

Pipe without Sockets.—If you erect the chimney with the socket ends up, which is the proper mode, and desire to finish with a cap or top, the last or top pipe on the chimney must be without a socket, so that the cap or top will fit over it.

Occasionally in transit a length of pipe may have a piece broken out of the socket; in that event knock off the remainder of the socket, or if broken below that point, cut the pipe off evenly with a hatchet, chisel or saw, and use it for a top pipe.

Openings or Ts.—Our chimney Ts are made in one and two feet lengths, and with openings 2 to 8½ inches in length; the latter are of sufficient length to pass through the side or partition of a building, as illustrated in chimneys 1 and 3. We also keep in stock Ts with openings ten and twelve inches long, for use when an extra length is required. If you desire to connect two stoves with one chimney below the ceiling, as illustrated in chimney 3, you would require two Ts each a foot in length, one with an opening of sufficient length to pass through the partition. Double Ts, or two openings on one pipe are sometimes used, but it is preferable to use the two short Ts, because the openings can be turned in any direction desired.

We make the openings of the following sizes, viz.: on the 5-inch pipe, 5 inch; on the 6-inch pipe, 5 and 6 inch; and on the 8-inch pipe, 6 and 8 inch openings.

Bottom Pipes.—Bottom Pipes are made in two foot lengths, with the supporting rim placed at different distances (6 to 16 inches) above the bottom or spigot end. These pipes are used where you wish to start a chimney in the middle of a room, or at some point where it is not convenient or desirable to construct a shelf. The projecting rim is made to rest on the ceiling joists, or any support erected for the purpose, and is of sufficient strength to carry the weight of twenty-five feet of pipe.

Elbows.—Elbows (see fig. 4, page 4) are rarely used in the construction of pipe chimneys.

Thimbles.—Should you desire to reduce the size of the opening, Thimbles can be used for the purpose, thus: 5-inch openings can be reduced to 4 inches by inserting a 4-inch Thimble, and in like manner a 6 to 5-inch and 8 to 6-inch with a 6-inch Thimble.

Tin Collars.—Where the pipe passes through a roof, ceiling, partition, or side of a building, the circular opening should be at least one inch larger than the outside diameter of the pipe, around which should be placed, and closely fitted to it, a tin or sheet-iron collar, which could be nailed to the wall or ceiling. When a tin collar is used where the pipe passes through the roof, hydraulic cement mortar should be used in connection with it, so as to make it perfectly tight and prevent leakage.

Iron Roof Plates.—A roof plate (as illustrated in chimney 2) is slightly flaring at the top, so as to give sufficient space around the pipe in which to place hydraulic cement mortar. The upper, or side of the plate nearest to peak of roof, should be placed under the shingles, so as to prevent water from running under and down the pipe into the building.

Another form of roof plate and one which we can highly recommend is illustrated in chimney 3. Instead of placing a pipe without a socket on the top of chimney, it is placed one length lower, and one with a socket substituted, and placed with the socket end down and over the roof plate and pipe.

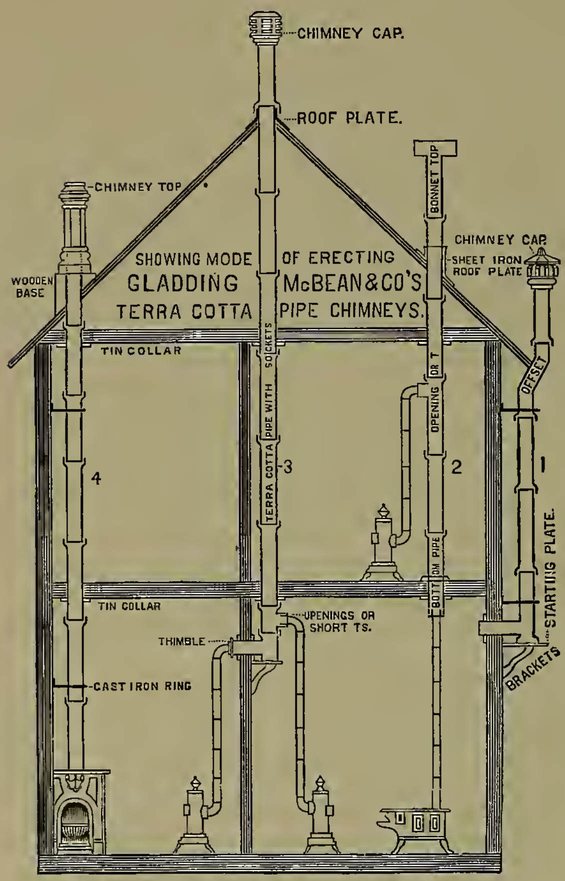
In this instance the roof plate must encircle the pipe closely. Any of the tops described on pages 39 and 40 will fit over the different sizes of our Chimney Pipe with the roof plate encircling it.

Starting Plates.—Starting Plates can be of Terra Cotta, Iron or Wood. Place on either of these plates a layer of mortar one or two inches in thickness, into which the pipe should be pressed; also place inside at bottom of the pipe more mortar, especially if a wooden plate is used. A common and secure way is to lay a couple of courses of brick work on a wooden starting plate or shelf, on which to rest the pipe.

With one of our hole starting plates the chimney can easily be cleaned. The hole can be closed with a cover, similar to those used to close stove-pipe holes in brick chimneys.

Mortar.—Either of the following mortars will answer for inside work: ordinary lime mortar well slacked, lime mortar and hydraulic cement mixed, or one part hydraulic cement to two parts of clean, sharp sand. For work exposed to the weather, use the hydraulic cement and sand, and use as soon as mixed.

Wooden Base.—A wooden base built into the roof, as illustrated in chimney 4, with the pipe extending six to twelve inches above the top of the base, on which and over the pipe is placed one of our Chimney Tops, which would make an ornamental and fine finish to the chimney, and prevent rain from entering it.



See Directions for Erecting our Terra Cotta Pipe Chimneys, on the preceding pages.

Terra Cotta Chimney Caps.

These Caps fit our 5, 6 and 8 inch Chimney Pipe. Also the Tops described on pages 39 to 42.

Wind Guard, Open Cap.

No. 15, 5 inch $1.00
No. 16, 6 inch 1.25
No. 17, 8 inch 1.50

Wind Guard, Open Cap.

No. 18, 5 inch $1.25
No. 19, 6 inch 1.50
No. 20, 8 inch 2.00

Plain, Covered Cap.

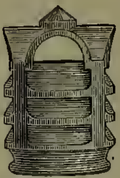
No. 21, 5 inch $1.00
No. 22, 6 inch 1.25
No. 23, 8 inch 1.50

Wind Guard, Covered Cap.

No. 24, 5 inch $1.50
No. 25, 6 inch 2.00
No. 26, 8 inch 2.50

Anti-Down Draught Cap.

No. 33, 5 inch $1.25
No. 34, 6 inch 1.50
No. 35, 8 inch 2.00



Anti-Down Draught Cap.

No. 36, 5 inch $1.50
No. 37, 6 inch 2.00
No. 38, 8 inch 2.50

Bonnet Tops.

With Prices, Etc.

Size.	Length.	Price.	Weight.
5 inch.	3½ feet.	$1.50	50 lbs.
6 inch.	3½ feet.	2.00	65 lbs.
8 inch.	3½ feet.	2.50	80 lbs.

These Bonnet Tops fit our 5, 6 and 8 inch Chimney Pipe.

Terra Cotta Chimney Tops.

Our Chimney Tops are made of superior Fire Clay, which we warrant to stand the weather in any climate. They are of a handsome buff color, and are highly ornamental, as well as useful for curing smoky chimneys, which are generally caused by wind blowing into the top of the chimney and obstructing the ascending current of smoke. But these tops are made in such a shape as to throw UP any transverse current of wind and cause it to pass over the flue instead of into it.

The value of Chimney tops is too much underrated; besides giving an ornament and finish to the chimney, the benefits of their use are numerous :

First, lengthening the chimney, thereby improving the draught

Second, separating the flues, thus preventing the smoke of one chimney from being blown down the one adjoining.

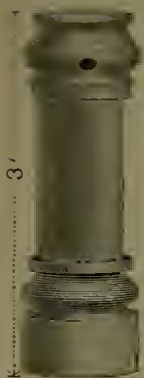
Third, protecting the top of the chimney from decay, caused by the gases of the coal destroying the adhesion of the mortar to the bricks or stones, as will be readily observed by an examination of the tops of chimneys in use a few years.

Fourth, unlike galvanized iron tops, they are not affected by coal gas or the weather, and do not rust out nor require replacing every two or three years.

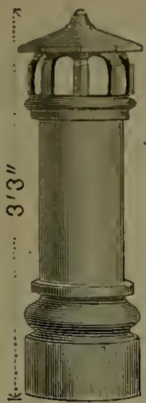
Directions for Placing Tops on Brick Chimneys.

Our tops are easily applied to any common chimney, by taking off one or two courses of brick, sufficient to give the top a firm hold in the brick-work, and then replacing the brick about the base of the Chimney Top with cement. See that the top is set perfectly level. Many persons are under the impression that these tops will not retain their places in windy weather, and think they should be constructed so as to SOCKET into the .chimney, but this is a mistake. If the proper pains are taken to set them on solid brick-work with cement, and in the manner above given, or even without enclosing their bases with the brick-work of the chimney, they will resist as heavy wind storms as the chimney itself.

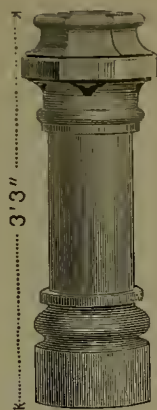
TERRA COTTA CHIMNEY TOPS.



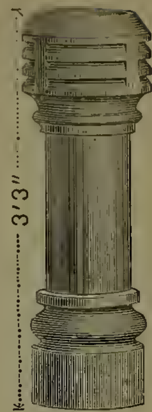
No. 102.



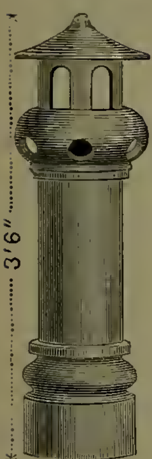
No. 152.



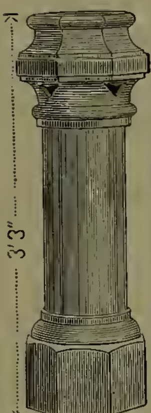
No. 155.



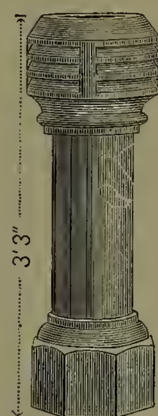
No. 158.



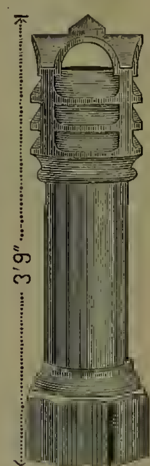
No. 161.



No. 166.



No. 167.



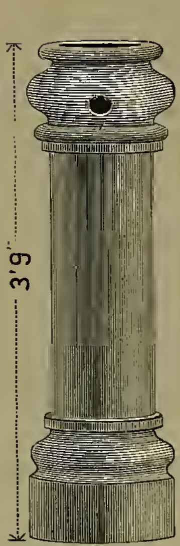
No. 168.

Price List.

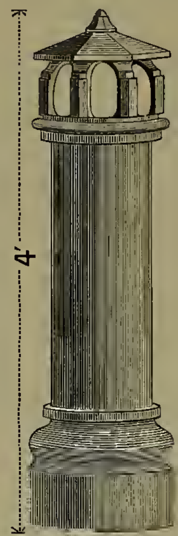
Number.	Price.	Outside Diameter at Base.	Inside Diameter at Base.	Inside Diameter at Top.
102	$3.00	12 inches.	10 inches.	6½ inches.
152	3.00	12 inches.	10 inches.	6½ inches.
155	3.25	12 inches.	10 inches.	6½ inches.
158	3.25	12 inches.	10 inches.	6½ inches.
161	3.75	12 inches.	10 inches.	6½ inches.
166	3.50	12 inches.	10 inches.	6½ inches.
167	3.50	12 inches.	10 inches.	6½ inches.
168	4.00	12 inches.	10 inches.	6½ inches.

The Tops on this Page will fit our 5 and 6 inch Chimney Pipe.

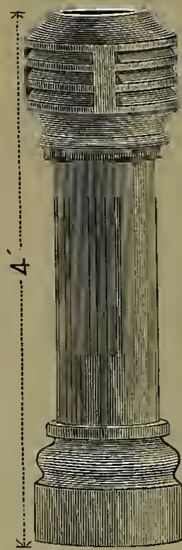
TERRA COTTA CHIMNEY TOPS.



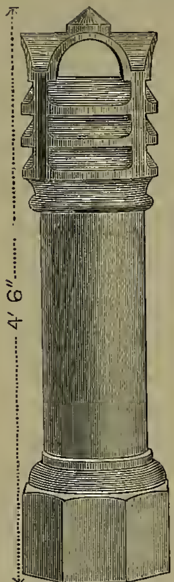
No. 103.



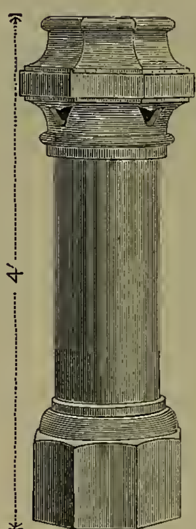
No. 153.



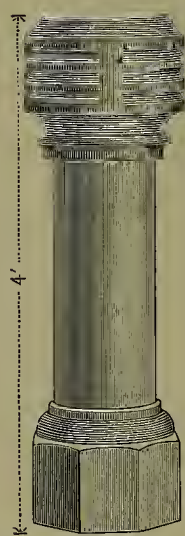
No. 159.



No. 136.



No. 138.



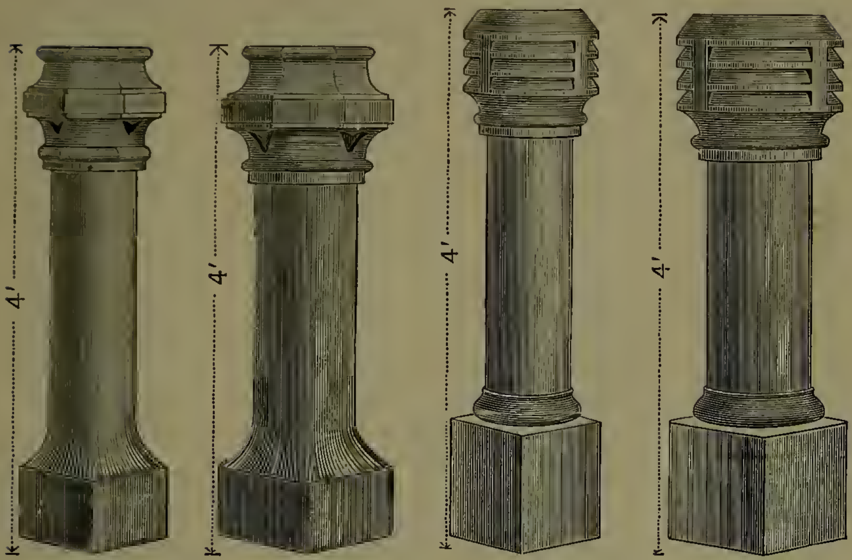
No. 139.

Price List.

Number.	Price.	Outside Diameter at Base.	Inside Diameter at Base.	Inside Diameter at Top.
103	$3.50	14 inches.	12 inches.	8½ inches.
136	5.00	14 inches.	12 inches.	8½ inches.
138	4.50	14 inches.	12 inches.	8½ inches.
139	4.50	14 inches.	12 inches.	8½ inches.
153	3.50	14 inches.	12 inches.	8½ inches.
159	4.00	14 inches.	12 inches.	8½ inches.

The Tops on this page will fit our 8 inch Chimney Pipe.

TERRA COTTA CHIMNEY TOPS.



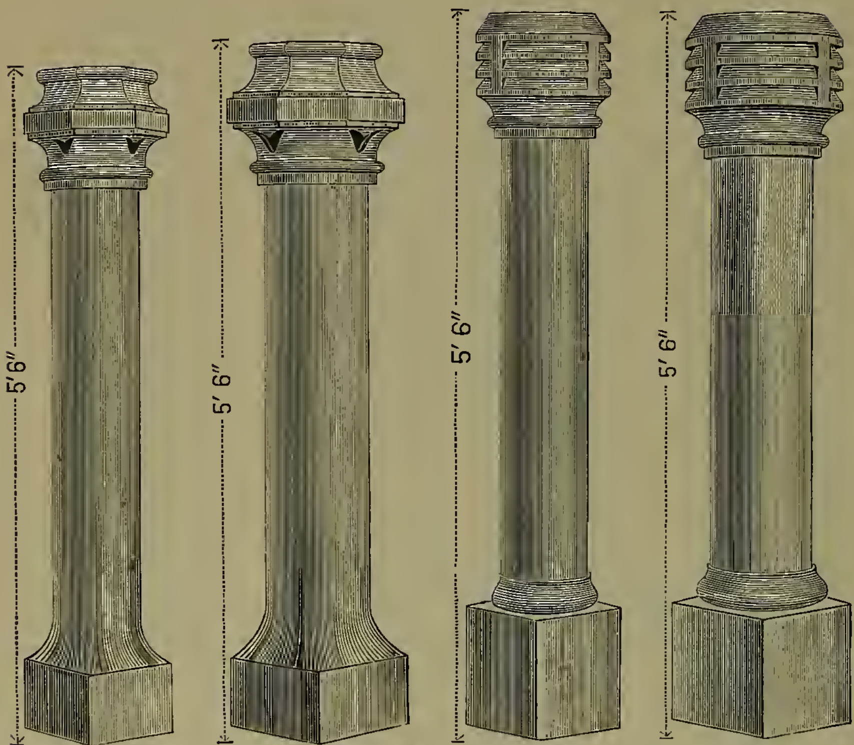
Nos. 121, 122, 123 & 124. Nos. 130, 131 & 134. No. 140. No. 141.

Price List.

Number.	Price.	Outside Dimensions at Base.	Inside Dimensions at Base.	Inside Diameter at Top.
121	$3.50	8x10 inches.	6 x 8 inches.	6½ inches.
122	3.50	8x12 inches.	6 x10 inches.	6½ inches.
123	3.50	8x14 inches.	6 x12 inches.	6½ inches.
124	3.50	10x10 inches.	8 x 8 inches.	6½ inches.
130	4.50	10x14 inches.	8 x12 inches.	8½ inches.
131	4.50	12x12 inches.	10 x10 inches.	8½ inches.
134	4.50	10x20 inches.	8 x18 inches.	8½ inches.
140	3.50	10x10 inches.	8½x 8½ inches.	6½ inches.
141	4.50	12x12 inches.	10½x10½ inches.	8½ inches.

These Tops will fit any size of Chimney Flue.

TERRA COTTA CHIMNEY TOPS.



Nos. 126, 127, 128 & 129. Nos. 132, 133 & 135. No. 142. No. 143.

Price List.

Number.	Price.	Outside Dimensions at Base.	Inside Dimensions at Base.	Inside Diameter at Top.
126	$5.00	8x10 inches.	6 x 8 inches.	6½ inches.
127	5.00	8x12 inches.	6 x10 inches.	6½ inches.
128	5.00	8x14 inches.	6 x12 inches.	6½ inches.
129	5.00	10x10 inches.	8 x 8 inches.	6½ inches.
132	6.00	10x14 inches.	8 x12 inches.	8½ inches.
133	6.00	12x12 inches.	10 x10 inches.	8½ inches.
135	6.00	10x20 inches.	8 x18 inches.	8½ inches.
142	5.00	10x10 inches.	8½x 8½ inches.	6½ inches.
143	6.00	12x12 inches.	10½x10½ inches.	8½ inches.

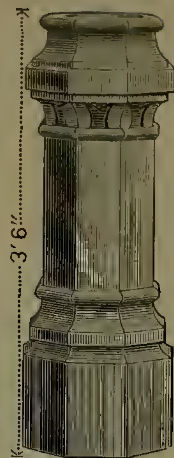
These Tops will fit any size of Chimney Flue.

TERRA COTTA CHIMNEY TOPS.

No. 150.

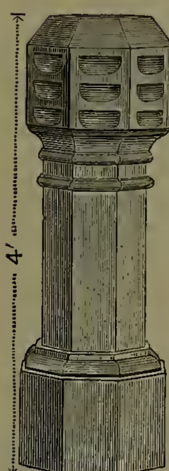
No. 148.

No. 109.

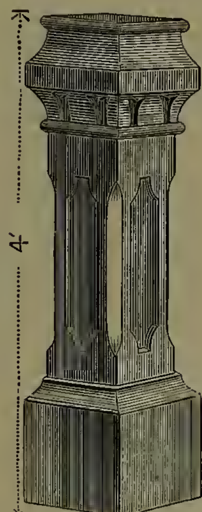


No. 110.

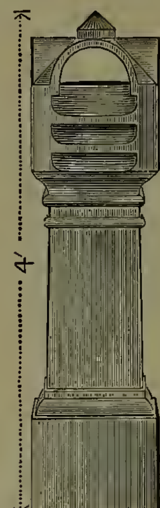
No. 149.



No. 146.



No. 112.

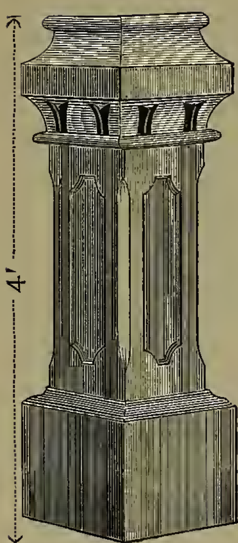


No. 147.

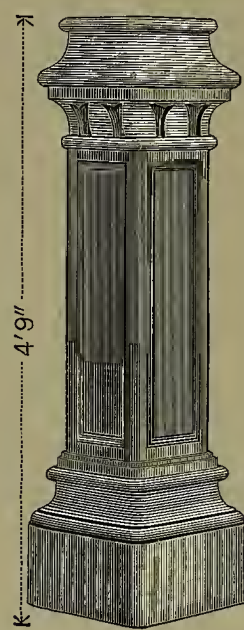
Price List.

Number.	Price.	Outside Diameter at Base.	Inside Diameter at Base.	Inside Diameter at Top.
109	$5.00	12 inches.	10 inches.	6½ inches.
110	6.00	14 inches.	12 inches.	8½ inches.
112	6.00	12x12 inches.	10x10 inches.	6x6 inches.
146	7.00	14 inches.	12 inches.	9 inches.
147	7.00	12x12 inches.	10x10 inches.	7x7 inches.
148	4.00	12x12 inches.	10x10 inches.	7x7 inches.
149	6.00	12x12 inches.	10x10 inches.	7x7 inches.
150	4.00	12x12 inches.	10x10 inches.	8 inches.

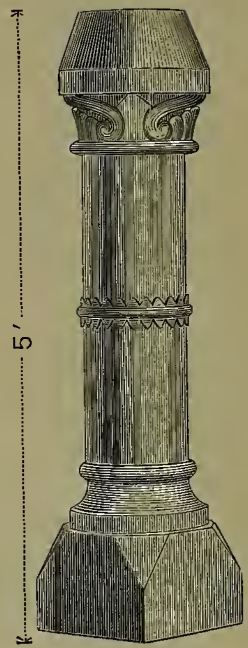
TERRA COTTA CHIMNEY TOPS.



No. 111.



No. 145.



No. 144.

Price List.

Number.	Price.	Outside Dimensions at Base.	Inside Dimensions at Base.	Inside Dimensions at Top.
111	$8.00	14x14 inches.	12x12 inches.	8x8 inches.
144	8.00	14x14 inches.	12x12 inches.	8 inches round.
145	8.00	16x16 inches.	14x14 inches.	8x8 inches.

Chimneys capped with Terra Cotta Tops have an architectural appearance, the top bricks are protected from the weather, and the draught is greatly improved.

We will guarantee the MATERIAL, WORKMANSHIP and STYLE of our Tops, as SUPERIOR to any other manufactured on this Coast.

Improved Flower Pots and Saucers.

No. 218.

Our improved Flower Pots and Saucers far excel the old style in strength, uniformity of shape, etc. These pots are of a light yellow color, made of a clay much superior to that which is usually put into such goods. As will be seen in the cut, they are made so that the shoulder of one rests on the edge of the other, thus preventing the wedging of one into the other, which is the main cause of breakage in transit.

Price List.

POTS.		SAUCERS.	
2 inch Pots	$ 1.50 per 100		
3 inch Pots	2 00 per 100	3 inch Saucers	$ 1.50 per 100
4 inch Pots	3.00 per 100	4 inch Saucers	2.00 per 100
5 inch Pots	4.00 per 100	5 inch Saucers	2.50 per 100
6 inch Pots	5.00 per 100	6 inch Saucers	3.50 per 100
7 inch Pots	7.00 per 100	7 inch Saucers	5.00 per 100
8 inch Pots	10.00 per 100	8 inch Saucers	6.50 per 100
9 inch Pots	15.00 per 100	9 inch Saucers	8.00 per 100
10 inch Pots	25 00 per 100	10 inch Saucers	10.00 per 100
12 inch Pots	35.00 per 100	12 inch Saucers	15.00 per 100

☞ When ordering our Improved Pots, if you also require the Saucers, be particular to state it in your order.

Packing of Flower Pots and Saucers, extra.

Shingled Pot and Saucer.

No. 222.

No. 222, 4 inch, per dozen	$1.00
No. 222, 6 inch, per dozen	1.50
No. 222, 8 inch, per dozen	2.50

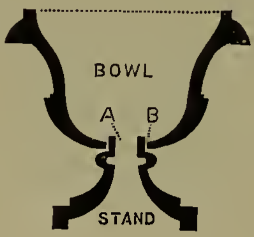
Palm Tree Pot.

No. 219.

No. 219, 14 inch, each	$ .75
No. 219, 16 inch, each	1.50
No. 219, 18 inch, each	2.00
No. 219, 22 inch, each	3.00

Terra Cotta Garden Vases.

The beauty and attraction of yards and lawns are much enhanced by the tasty disposal of a few Vases. We can furnish them in numerous designs, at half the cost of iron, while the material of which they are made is much better adapted to the healthy growth of plants.



For safe shipment, we make our Vases in two parts; the upper part is known as the *Bowl*, and the lower part as the *Stand*.

When the bowl and stand are placed together, the open space marked B should be filled with cement, so that the water will be forced to pass down and out through the hole in the stand, marked A.

If you paint the Vases, they should be oiled inside and out with boiled linseed oil, before painting.

TERRA COTTA VASES.

Nos. 1 to 5.

Nos. 12 and 13.

No. 10.

No. 24.

No. 15.

Prices and Dimensions.

No. 1	Width, 13 inches.	Height, 12 inches.	Price, $1.25
No. 2	Width, 15 inches.	Height, 13 inches.	Price, 1.50
No. 3	Width, 17 inches.	Height, 15 inches.	Price, 2.00
No. 4	Width, 20 inches.	Height, 18 inches.	Price, 2.50
No. 5	Width, 23 inches.	Height, 20 inches.	Price, 3.00
No. 10	Width, 15 inches.	Height, 15 inches.	Price, 2.50
No. 12	Width, 13 inches.	Height, 14 inches.	Price, 1.75
No. 13	Width, 17 inches.	Height, 18 inches.	Price, 3.50
No. 15	Width, 14 inches.	Height, 21 inches.	Price, 3.00
No. 24	Width, 18 inches.	Height, 22 inches.	Price, 4.50

TERRA COTTA VASES.

Vase No. 4.

Pedestal No. 50.

Vase No. 5.

Pedestal No. 51.

Vase No. 4.	Width, 20 inches.	Height, 18 inches.	Price, $2.50
Vase No. 5.	Width, 23 inches.	Height, 20 inches.	Price, 3.00
Pedestal No. 50.	Width, 16 inches.	Height, 15 inches.	Price, 2.50
Pedestal No. 51.	Width, 21 inches.	Height, 20 inches.	Price, 4.00

TERRA COTTA VASES.

Vase No. 23.

Pedestal No. 55.

Vase and Pedestal sold separately if desired.

No. 23. Vase.	Width, 21 inches.	Height, 18 inches.	Price, $4.00
No. 55. Pedestal.	Width, 16 inches.	Height, 20 inches.	Price, 4.00

Vase No. 27.

No. 27. Lawn Vase.	Width, 27 inches.	Height, 28 inches.	Price, $15.00

LAWN VASES.

No. 28.

No. 26.

No. 26.	Width, 27 inches.	Height, 38 inches.	Price, $20.00
No. 28.	Width, 26 inches.	Height, 42 inches.	Price, 25.00

No. 28, an EGYPTIAN VASE.—Copy of a Vase found in the ruins of Thebes. Though broken in many pieces, on placing the fragments together it was found to be entire, and is now in the British Museum. Antiquarians think it more than 3,000 years old.

FIRE-PROOFING, within the past ten years, has advanced rapidly to a position of great importance in the construction and protection of our prominent buildings, and few who can recall the general apathy toward any innovation upon the stereotyped methods of constructing buildings a few years since, can realize the encouraging progress made in the introduction and practical application of fire-proofing. In fact, a building erected at the present time, of any size or importance, is an exception if some method of fire protection is not incorporated in its construction.

This change, marking as it does an era in building, has not been spasmodic, but rather the result of constant demand, produced, to a certain extent, by the efforts put forth by the promoters of non-combustible methods of building, but largely by the desire among careful, thinking men, who contemplate the erection of beautiful buildings, to make them not only ornamental, but thorough and substantial as well.

The losses by fire during the last decade have been almost unprecedented in the history of the West, and this has contributed in a marked degree to the demand for protection against the arch enemy, *fire*, not by carrying a heavy line of insurance (insurance will not prevent a building from burning), but rather in the only real protection to the interest of capital, *i. e.*, in so erecting buildings that loss by fire is made impossible, thus obviating a heavy annual outlay for insurance premiums.

Can a Building be made Fire-Proof? This is a question asked by thousands—and generally doubted even at this day. We maintain that a building can not only be erected fire-proof, but that when so designed, is necessarily constructed of material proof against the action of fire, and at the same time much more substantial and time-enduring than a combustible form of structure.

What constitutes a Fire-Proof Building? Our reply is that the term *fire-proof*, when applied to a building, contemplates that the edifice, in all its *structural* parts, should be formed entirely of non-combustible materials, meaning thereby that all the interior and exterior of the structure should be built of material calculated to successfully resist the injurious action of extreme heat. Beginning with a substantial foundation, the walls of a "Thoroughly Fire-Proof Building" should be built either of brick or stone. The great Chicago fire of 1871 demonstrated conclusively that the only building material that successfully withstood the fire was "brick;" hence we say, construct your building of good brick as a base, and beautify it as taste may dictate, with terra cotta, etc.

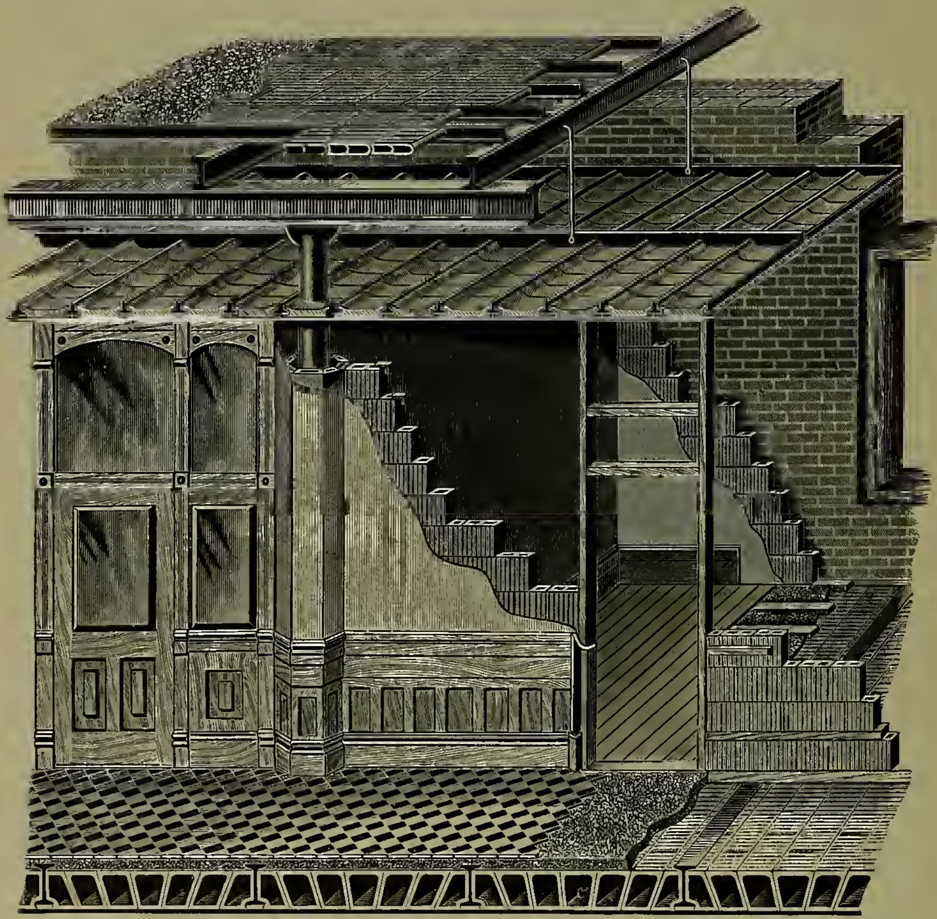
After the walls, the next factor of importance is the floors. In all cases they should be built with a combination of iron I-beams and non-combustible filling, covered over with cement concrete.

The partitions for dividing the various floors into rooms, corridors, etc., should be built of absolutely non-combustible material, and where the roof and upper ceiling of the building are treated similarly, all danger of spread of fire in such a building is made impossible.

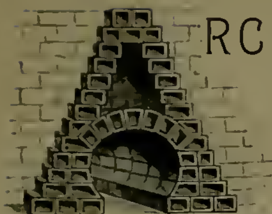
It is often observed by skeptics that the wooden flooring, base, wainscot, architraves, doors, etc., that are put into a fire-proof building after the plastering has been applied, is sufficient to burn the structure. This is most emphatically a misrepresentation, and can only be accepted as truth by novices, for the reason that so long as "fire" can be confined to its prescribed limits, as in the case of furnaces, boilers, fireplaces, etc., it becomes an easy agent to control; but when afforded any opportunity by flagrant neglect in building,

it is a matter of time only when the best structure, built of combustible materials, will be reduced to cinders; therefore, we maintain that when the *structural* portions of the building are non-combustible, the contents can be what they may; and in case fire does attack them, the loss is merely nominal, as the fire cannot spread from the room of its inception.

The use of various materials has been introduced for the purpose of fire-proof protection for buildings, all more or less effective. The general, and perhaps to-day the oldest modern system for floor construction, has been the brick arch between iron beams; then have followed the corrugated iron and concrete arch, lime of teil plaster arch, and numerous others, including the Hollow Tile flat arch. All these systems have their advantages, and consequently any of them are much to be preferred to a wooden form of construction, but they also have disadvantages when compared one with the other.



The above view represents the interior of an *ideal fire-proof building*, and in presenting it a positive reply is given to those who may doubt the possibility of absolute protection from fire in a building.



ARCHES for floors form by far the most important relation to the fire-proof quality of the *interior* of a structure. Ages ago it was usual to rely upon the stone or masonry arch in groined form, for fire-proof floor protection; but the advent of the iron era has rendered obsolete the time-honored methods so long tried and so historically perfect, which to-day stand as firm as they were centuries ago, but which the spirit of the age has discarded. We have learned to build, undeniably not so permanently, but certainly much cheaper than our ancient predecessors; and the problem now is, to produce the result required with the use of the least amount of material and in the shortest space of time.

The use of iron beams for floor construction dates from 1820, they being first introduced in England. Since their advent the necessity for some non-combustible material to fill between the beams has been felt to such a degree that numberless forms and composition of materials have been introduced, tried, and found wanting in some essential particular. Hollow Tile Floor Arches have withstood the tide of adverse criticisms for sixteen years, and to-day rank first as compared with every other form of material for this purpose.

We claim for our system of Floor Arch construction the *greatest strength* with the least amount of *space* and *material; it is but one-third the weight of brick or concrete arches*, affords a level ceiling beneath, without the necessity for furring and lathing.

The soffits of the iron beams are completely fire-proofed, can be set in place in any season of the year, and are ready for plastering almost as soon as laid; and finally, all things considered, is the cheapest and most satisfactory form of construction known.

On page 66 we give a table of sizes and weights of iron beams recommended by us to be used with our Hollow Tile Floor Arches.

Architects, in specifying for the use of Hollow Tile Arches, should state the size (governed by the depth of the beam) of the tile required, a full list of sizes which we manufacture being shown on the drawings. We carry a stock of the standard sizes, and can fill orders at short notice.

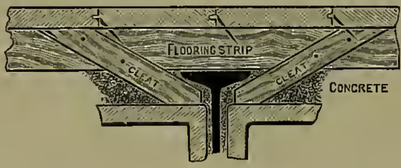
Floor arches, to form a satisfactory job, should be made of the best quality of fire-clay, mixed with a small percentage of potter's clay. The tile should be free from cracks or defects affecting their strength to sustain weight, and should in all cases be capable of sustaining, after being set in place, an equally distributed load of 500 pounds upon each superficial foot of surface without deflection.

Properly constructed, portable centers are required to set the tile arches, and these should remain in place at least twenty-four hours after the arches are set, before being "struck."

The voussoir or butment pieces, being those next the beam, are formed in such a manner as to support the flat beam tile, as shown on the sections. These butment pieces should be carefully set, and rest squarely upon the flange of the beam; each section or piece of tile forming the arch should be of such shape as to make it impossible to dislodge any one piece from its position by contact from the top,—in other words, should be "key-shaped." The last or center piece is called the "key," and upon the setting of this piece the strength and solidity of the arch is largely dependent; it should always be made to fit tight in its place, and in no case should a joint exceeding one-half inch be permitted. In laying the tile, a mortar composed of lime mixed up with coarse screened sand, in proportions of four to one, and richly tempered with hydraulic cement, should be used. This makes a strong mortar, and works well with the tile. Usually the tile are "shoved" to place with full horizontal joints, and butt joints left dry.

In cases where there is no plastering to be applied, the butt joints should be "flushed up" while the tile are being laid.

In all cases, the tile should be laid to "break joints" alternately, one with the other.



The drawings of the arches represent the tile as filling the beams within one inch of the top. The object of this is to afford a chance for the usual wooden floor or furring strips to be attached, by means of a cleat nailed to the furring strip, and caught under the top flange of the beam.

Variations in the spans from center to center of beams are arranged for by using with the arch, as necessity may require, "Half Intermediate Tile," and several sizes of "Key Tile."

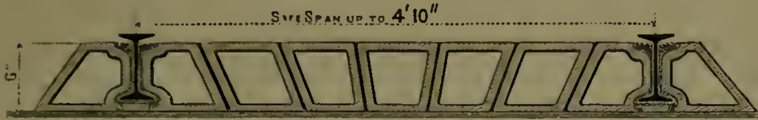
When we can ascertain the number of lineal feet of the various spans of arch that will be required, no difficulty is caused, however much they vary, as we only ship the proper forms necessary to accommodate the spans.

It is a safe rule, however, for architects to so arrange their ironwork that the size of arch to be used and the span between the beams will be as near uniform as possible throughout a building designed for Hollow Tile.

Plastering can be applied directly on the surfaces of the tile. We recommend one thin, scratched, and one brown coat before applying the hard finish, in order to form a perfect job of plastering; this, however, on the tile should cost no more than the ordinary two-coat plastering, for the reason that there is no mortar wasted in the "clinch," as is the case in plastering on lath. Prominent plasterers have stated their preference in favor of plastering on any kind of tile work as compared with lathing, and no extra charge is ever allowed.

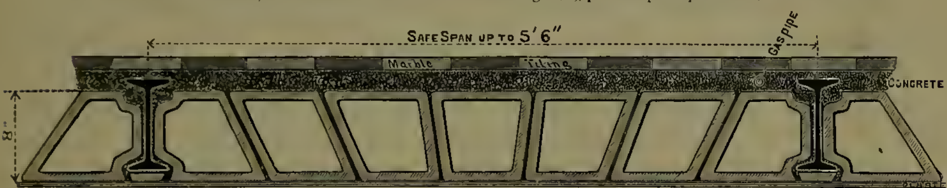
Hollow Tile Arches, when finished in place, should be left straight and true upon the under side; but no pointing up or filling of butt joints is necessary, for the reason that the plaster coat is benefited by such roughness.

STANDARD ARCHES.

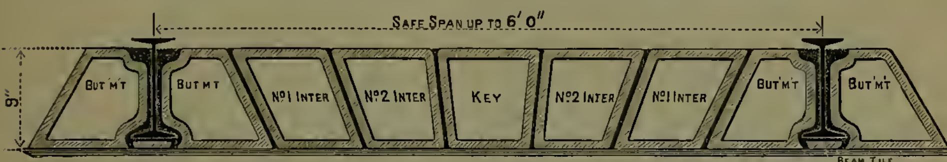


Standard 6-inch Hollow Tile Floor Arch. Weight, 23 pounds per square foot.

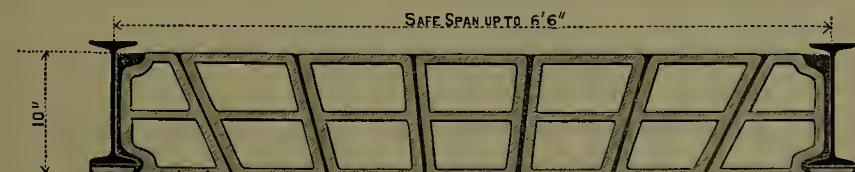
Standard 7-inch Hollow Tile Floor Arch. Weight, 25 pounds per square foot.



Standard 8-inch Hollow Tile Floor Arch. Weight, 29 pounds per square foot.



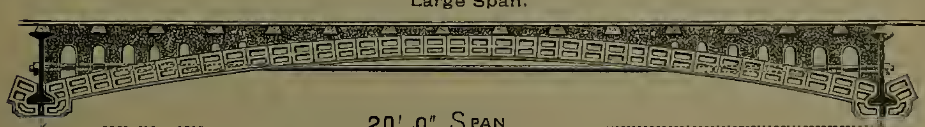
Standard 9-inch Hollow Tile Floor Arch. Weight, 33 pounds per square foot.



10 inch Web Tile Floor Arch. Weight, 40 pounds per square foot.

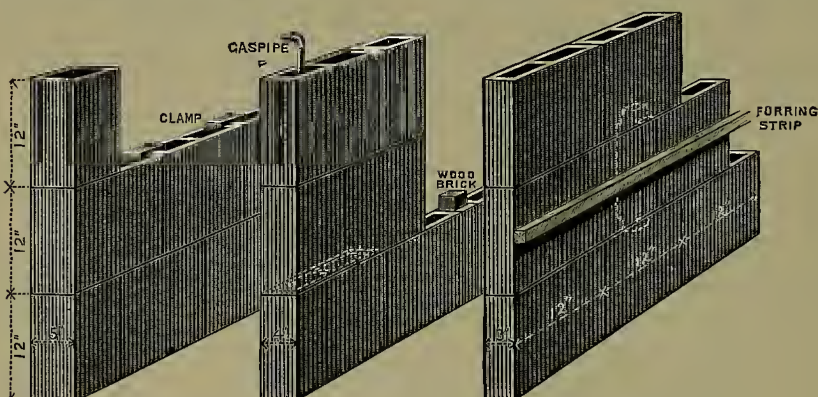
During the past two years there have been introduced large span segment Hollow Tile Arches, like the drawing, for use in malt-houses, breweries, warehouses, etc., where it was

Large Span.



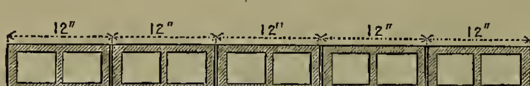
not considered necessary to obtain level ceilings below, and the results obtained have proven both economical and satisfactory.

PARTITIONS dividing the various floors of a building into compartments are, perhaps, next of importance to the floor construction in the necessity for fire-proof treatment, and we maintain that no building can be considered safe from the injurious effects of fire, built with partitions constructed in the ordinary manner, with wooden studs covered with laths, even though the floors should be fire-proofed. The combustible nature of a stud and lath partition is so great that the entire structure would be seriously injured should a fire once get fairly under way. We have therefore conformed hollow tile to the requisite shapes, to enable us to build fire-proof partitions only three inches thick, that are in themselves as proof against fire as the best twelve-inch brick wall. The advantages we claim for Hollow Tile Partitions above all other methods are: Greatest strength, with the least amount of space and weight; absolutely *indestructible by fire;* sound, vermin and rat proof; perfect surface for the receipt of plaster, and adaptability to the use of the architect, it being easy to accommodate tile to all the various angles and returns of a building without increasing the expense.



Views of 3, 4 and 5 inch Tile Partitions.

We make tile for 2, 3, 4, 5 and 6 inch partitions, and the material used is the same as for floor arches, the shape only being changed. The tile are laid in regular courses, 12 inches high, to "break joints," thus making a firm and substantial wall, and accounting to a great extent for the wonderful strength of the light partitions that have been built by us.



Plan View of Partition.

Mortar, composed of rich lime and coarse, sharp sand, is used to lay the tile for partitions that are built in the interior of buildings, but rich cement mortar should be used wherever the tile comes in contact with the weather. In building the tile partitions, wood bricks are set in the vertical and horizontal joints to afford nailing surface for the architrave, base, wainscot and wherever necessary.

It has been urged against Hollow Tile that the difficulty of driving nails into it acts as a disadvantage, and reference is made to partitions composed of soft, *spongy* composition, such as lime of teil and cinders and terra cotta lumber, the claim being that no wood bricks are necessary. While the fact is acknowledged that it is possible to drive a nail into the materials mentioned, our experience has shown us the folly of relying upon a nail driven into a substance without fibre, particularly when done with the intention of securing woodwork. In fact, so-called terra cotta lumber walls are all built at this date with wood jambs, studs and blocks, as it has been found impracticable to rely upon soft-burned clay tiles as a nailing ground. Therefore, we maintain that the hardness of Hollow Tile is no disadvantage to it, but rather in its favor, particularly as it is a guarantee of *strength* and lasting qualities; and all danger from frost or dampness during construction is obviated, as the hard-burned Hollow Tiles are not perceptibly affected by the elements; whereas, porous terra cotta lumber is so slightly burned that the least dampness affects it, and, combined with frost, a total collapse from disintegration is usually the result. Again, it has been ascertained recently that, owing to the soft burn that is given porous terra cotta lumber, the salts remaining in the poor quality of clay used in its manufacture exude themselves after the plastering has been applied to the walls, and many a costly job of frescoing has been destroyed when applied to walls built with terra cotta lumber.

Objections of this kind cannot be made to our Hollow Tile, as we use only the best quality of fire-clay in our manufacture, and are thus enabled to burn the material sufficiently to effectually destroy any alkali—exudating salts that might exist in the clay.

At all openings in the partitions 2x4 wood frames are set, to stiffen the jambs and afford grounds for the plastering, and also for the attachment of the architraves, etc., as shown by sketch.

In all buildings designed for the use of Hollow Tile partitions, provision should be made for the attachment of picture moldings, which are not only a most useful addition, but at the same time add much to the finish of a room. The Hollow Tiles for partitions, being built with the hollow spaces running vertically, afford ample opportunity for the introduction of flues for ventilating, heating, etc.; also for the concealment of gas and water pipes, which are built in the hollow of the tiles. Electric wires, speaking-tubes, etc., can be disposed of in the same manner.

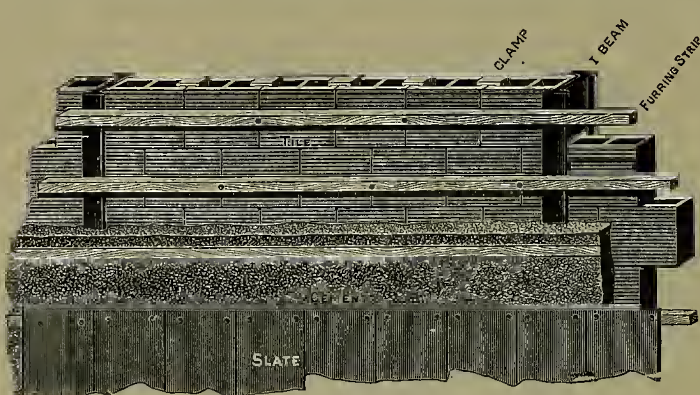
Architects, specifying Hollow Tile for interior partitions, should state the size required and designate any change in or addition to the ordinary partition that may be desired. In all cases, of course, the work is to be built plumb, straight and true, but, as is the case in any masonry wall of one thickness of material, it is not to be expected that both sides of the partition should be "fair," but that the walls should be left reasonably straight and even on both sides for the plasterers.

We have frequently had occasion to test the strength of our partitions in unusual manners. In one instance there was erected a 4 inch tile partition 20 feet long and 132 feet high without extraneous support, and the wall can be seen at any time at the Calumet Building on La Salle street, Chicago. On another occasion a wall was built 30 feet long and 22 feet high, and in making an alteration in the location of a doorway some 22 feet of the wall by 8 feet high was cut out, and to test the solidity of the wall, it was not shored up, and the 14 feet remaining above the opening held its position without a crack appearing in the plastering.

ROOF CONSTRUCTION for fire-proof building is, perhaps, the most important external feature of the structure, and often receives but little attention. A good fire-proof roof is certainly a great desideratum, but how few really non-combustible roofs are erected? It seems to be generally conceded at this time that a building in order *not to burn* should be thoroughly fire-proof in *all its parts*, but we are constantly hearing of buildings designed complete throughout the interior of non-inflammable material, but inclosed with a roof constructed principally of wood. Why it should be so, we are at a loss to determine. The danger of such a method of construction has been demonstrated on numerous occasions, principally by the burning of the wood roof of the United States Patent Office Building at Washington, and recently by the wholesale destruction of the roofs of various court houses and office buildings in the West.

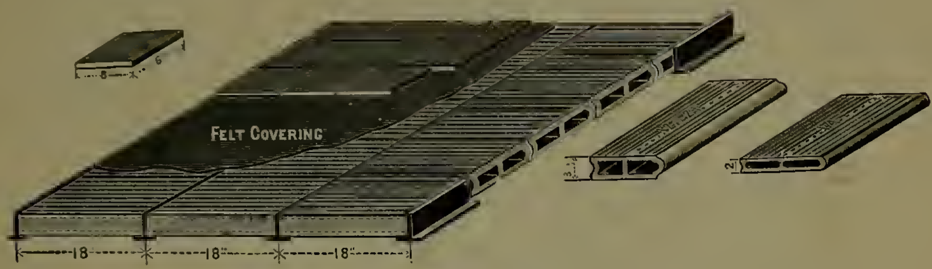
That substantial fire-proof buildings should be erected complete to the roof line, and then endangered by a cheap wooden fire-trap, as an apology for a roof, is a satire upon the reasoning faculty of the constructor, as there seems to be no consistent reason for such a "penny-wise" principle, when "Hollow Tile" can be so readily adapted for the purpose of every form of roof construction.

We show in the drawings several methods of roof construction with the tile applied. The first is a view of a mansard roof formed of I-beams, set 5 to 7 feet from center to



center, and filled in between with 3 inch Hollow Partition Tile, provision for nailing slate being made by attaching 1¼x2 inch wood strips to the outer face of the tile, the strips being set at the proper distances apart to receive the slate—the spaces between the strips being then plastered flush and smooth with cement mortar.

This is the most economical form of mansard that we know of, for the reason that very little ironwork is required, and the tiles are quickly applied. The use of wood strips is no disadvantage to the fire-proof quality of the roof, for it is generally known that slates in themselves are quickly destroyed by fire, and after they have fallen off the only damage to the roof would be to burn off the strips, further spread of the fire being effectually retarded by the Fire-proof Tile.



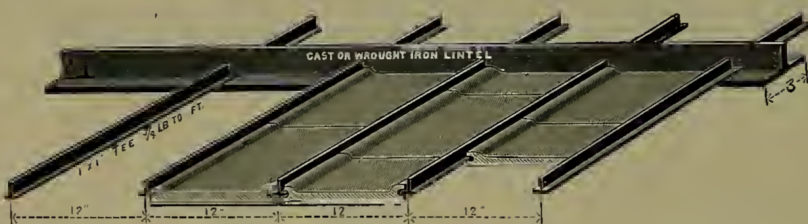
Hollow Tile set between T-irons makes a perfect roof when the weathering to be used is either felt, composition, cement or asphalt. The tiles are set in place between the T-irons with good cement mortar, the tops of the tile being left sufficiently smooth to receive the weathering, which is applied directly upon the surface of the tile. Composition, cement and asphalt have a natural affinity for the tile, and adhere readily to it without the use of nails or fastenings. We make various sizes and forms of tile for deck roofs, as shown in the drawings.

Hollow Tile Floor Arches of the light patterns are also used for roofs, the tops of the tiles being set sufficiently smooth to receive the weathering when so ordered; but we recommend that when Tile Arches are used for roofs, that a ¾ inch coat of cement mortar be applied before the weathering is put on. Where it is desired to fire-proof wood roofs, we use a tile similar to the furring tile for outside walls, laid in place upon the top of the

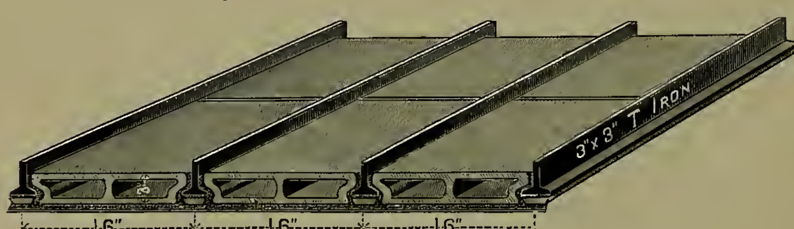
sheathing-boards in good cement, and then covered with the weathering.

One and one-fourth inch thick Solid Segment Tiles are sometimes used for roofing purposes where it is desired to expose the under side of the tile and make an ornamental finish. This form of roof, laid between T-irons and neatly pointed below, has been used in many cases for boiler rooms, factories, etc., and presents an excellent appearance.

CEILING AND FURRING. In most buildings of importance it becomes necessary to construct a false ceiling between the top floor and roof to disguise the pitch of the roof. Usually this ceiling has no other purpose than simply to make a straight surface for the plastering, there being no necessity for any more strength than just sufficient to sustain itself with plastering, etc., therefore the simpler and lighter this ceiling can be made, the better. We manufacture a ceiling formed of ½ inch thick fire-clay tiles, with grooved edges, resting upon 1x1 inch T-irons, as shown in the drawings. These irons are set 12 inches from center to center, and will span up to 7 feet. They are in turn sup-

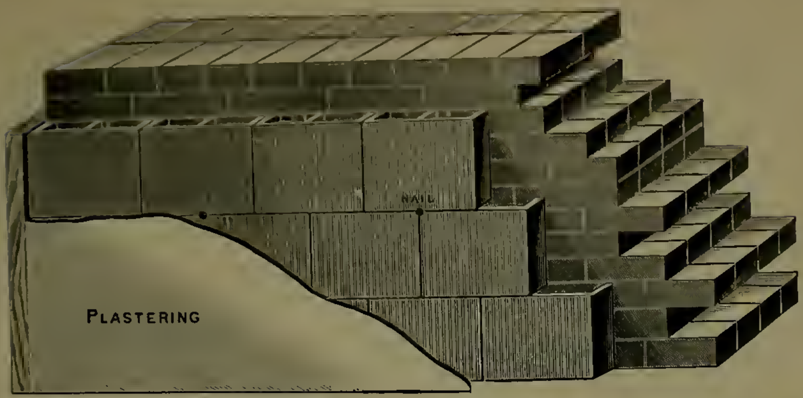


ported by an L-iron running at right angles with themselves. The L-iron is punched at regular intervals of 12 inches, with holes, the same section as the T-iron, just large enough to permit the small irons to pass through, thus holding them securely in place without the necessity for bolts, rivets or screws. The L-irons are in turn supported, as the case may be, either from the soffits of the roof rafters or trusses, with light ½ inch rods attached to the same and furnished with nut and thread, so that any settlement or irregularity in the level of the work can be adjusted.



Another form of false ceiling is constructed by using 3x3 T-irons, set 15 inches from center, and filling the same with flat tiles bedded in the flange of the T-irons, with fire-clay slab supported below the iron as shown. This ceiling is light and strong, and if necessary could be used as a floor for light purposes.

We have occasionally been required to attach false ceilings to the soffit of hollow tile floor arches, for vent flues, etc., and have accomplished it by the use of small bolts with T-heads, which are inserted into holes punched in the tile, and drawn close to the same with nut and thread. These bolts support 1¼ by No. 14 band iron, between which our ½ inch ceiling tiles are set.



1½ inch Furring on Brick Wall.

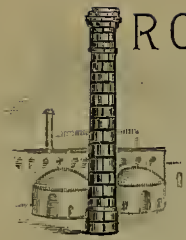
The necessity for some non-conducting, fire-proof material to take the place of the wood and lath furring, usually applied on the interior of outside brick walls, to obviate the penetration of moisture, has long been felt, and we have made many experiments, with a view to securing the best form of material for the purpose at a moderate cost.

The usual method of securing furring has been to tack wood strips to the brick wall forming the required projection, and then nail wood or iron laths to the same, or, as is occasionally done, to build the main walls of sufficient thickness to allow them to be built with a small air-space in the center, called "cavity walls."

The objections to the foregoing methods are numerous; but the following reasons will be sufficient to explain the necessity for a radical change in this system of furring for buildings. When wooden laths are secured to the strips mentioned, the effect, when plastered, is to produce a surface that is easily distinguished from the remaining sides of a room by the dark discolorations of the laths and strips showing through the plaster. This is caused by the moisture coming through the walls and being absorbed by the wood, thus dampening the plaster sufficient to accumulate dust and present an unclean and irregular appearance. This fact is equally true of iron lath, the moisture causing it to rust and discolor the plaster, and in addition the changes in temperature subject the iron form of lath to the damaging effects of expansion and contraction, causing the plaster coat to be cracked and unsightly. The objection and consequent unpopularity of the cavity form of wall is the additional weight, space, and material required by its use, rendering it too expensive for the purpose. By the use of our fire-proof tile furring all these defective features are obviated, while at the same time a substantial, economical, non-decaying, and fire-proof material is obtained with all the advantages, but none of the defects of the numerous other forms of furring at present in use.

The furring tile are laid up in regular courses, with "break joint," good cement mortar being used. All necessary wood, bricks, etc., are built in the tile. By our method of furring, as will be observed by reference to the drawing, a complete circulation of air is obtained over the entire surface of the furred wall, which accounts for the universal freedom from dampness, where our furring tile have been applied.

We maintain that a "Hollow Space" is essential to a perfect furring, and when a circulation of air can be obtained, all danger from the injurious effect of damp walls upon the interior finish is overcome.



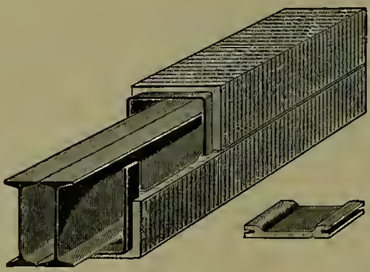
IRON enters largely into the structural economy of modern fire-proof buildings, and assumes important relations to the constructive detail of the work. Upon the economical use of iron much is dependent to obtain the result required at the minimum cost. Iron has been an active agent in the past thirty years in the building arts. It has enabled the architect to accomplish wonders in the erection of buildings, when the greatest factor of strength within a limited space has been required, but valuable though it is, as a constructive agent, *it is not a fire-proof material*, in the sense that it will resist a severe heat without injury. Therefore it has been determined that where iron is used as a building material, it should be protected from injury by fire with a non-combustible material in such manner as to preclude the possibility of fire heating it to an extent sufficient to warp or twist it out of shape.

Plan of Solid Tile Column Covering.

To this end we recommend that all the exposed portions of the iron columns, girders and roof trusses of a building should be thoroughly protected by being incased with a covering of tile. The foregoing drawing represents an iron column inclosed with 1¼ inch solid fire-clay tile.

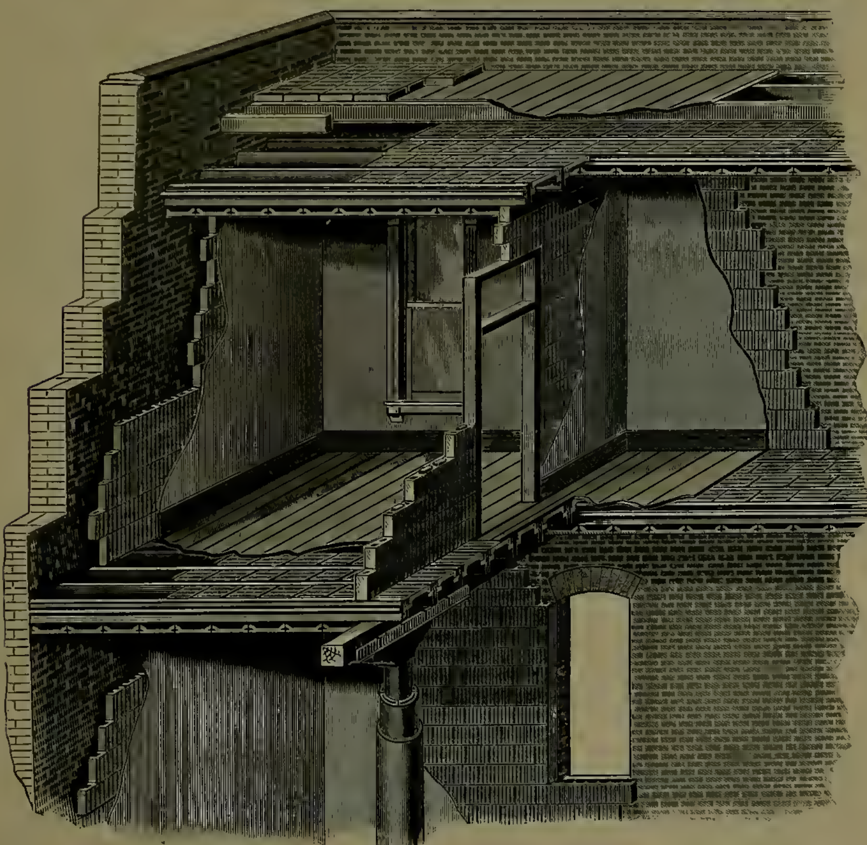
The tile are made of fire-clay, molded to suit the section of the column incased; an air space of one inch is left next to the column to act as a non-conductor. The tile are usually made in two pieces, and are laid to "break joint" on each alternate course, the different pieces being bound to each other with small cast-iron clamps, set in the ends of the tile, completely securing the tile in place, without the necessity for tapping or drilling the iron column. We can apply our fire-proof tile to any form of column, and no special provision need be made for the receipt of the tile, so far as the shape of the column is concerned.

Solid Tile Fire-Proof Column.



The above view shows our method of fire-proofing iron girders. We use for this purpose fire-clay tiles with grooved edges, similar to our ceiling tile; these are secured in place with band-iron strips encircling the girders; the tile are laid between the strips with gauged mortar. An air space of at least one inch is secured between the iron and the tile, which acts as a non-conductor and adds greatly to the efficiency of the fire-proof protection. After the fire-proof tile are applied the columns and girders are treated with cement plaster or scagliola, as taste may dictate.

WOOD, as a building material, is pre-eminently the most useful of all constructive substances, being easily worked and rapidly applied, and had it fire-resisting qualities would be perfect. Within the past five years, we have experimented largely with a view to perfecting a method of building by using wood as the structural agent, in combination with hollow tile. The results obtained have been unexpectedly successful, and we have demonstrated that a wood building can be made practically fire-proof if erected upon our plan.

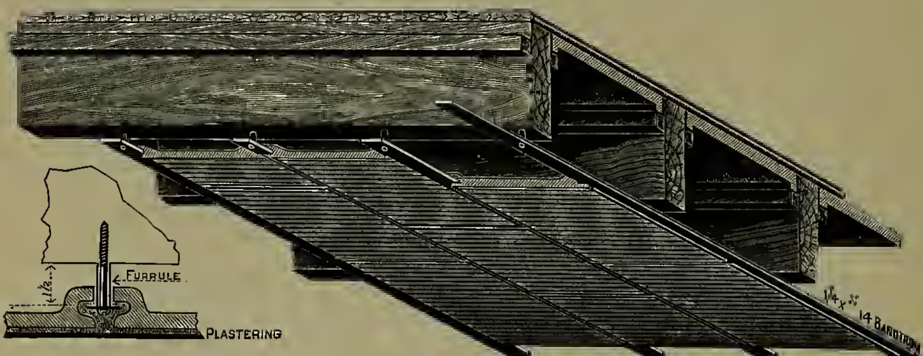


Interior View of Fire-Proofing Applied to Wooden Construction.

Our object in endeavoring to introduce this method of fire-proofing has been to cheapen the cost so that owners can afford to take advantage of the system for buildings in which an *absolutely* fire-proof system could not be incorporated on account of the expense. Many large and important buildings are erected, without protection from fire for the interior, that could, by the use of our tile, be made practically fire-proof at an advance

on the original cost of not to exceed ten per cent., while at the same time the building would be constructed with so much better materials that the additional cost would be more than compensated for, say nothing of the protection against fire.

Our method of applying tile to woodwork is clearly shown on the drawing which represents the interior of a building constructed with wood joists, etc. Beginning with the floors all the exposed woodwork is covered with fire-clay ceiling tile, which is applied directly upon the soffits of the joists, as shown upon the drawings. These tiles are 12x12 inch, by ½ inch thick, and are formed with grooved edges or ends and supported in



View of a Suspended Ceiling.

place by 1¼ No. 14 band iron, which is in turn secured to the joists with 3 inch barbed nails and galvanized iron separators in such a manner as to prevent the tile coming within ½ inch of the wood, thus affording an opportunity for the circulation of air, preventing dry rot, and, in case of a fire, reducing the hazard of the heated tiles igniting the wood.

The band irons are punched with holes at regular intervals, corresponding with the distances between center of the joists or rafters to which the ceiling is attached, and are securely held in place by the nails. No provision, other than what would be necessary for attaching wood lath, is required for our suspended tile ceilings, as they can be applied to any form of woodwork, without special preparation. The ceiling tiles are made of fire-clay, medium hard burned, and are scratched before being burned, to afford a good key for the plaster finish. These tile we have tested to withstand the hottest fire for a space of one and one-half hours without allowing the wood joists to burn; the tile takes the place of the ordinary wood lath, and forms an excellent base for the plastering. The tops of the joists are protected either with bridging tile set between them or else with 2 inch thick cement grouting.

After the floors are securely protected, the interior partitions are then erected. These are constructed of Hollow Tile, which are in themselves absolutely fire-proof. Our 1½ inch furring tiles are used on all the exterior walls instead of wood, and all the iron columns and girders are thoroughly incased with tile. A building constructed upon this plan we claim will withstand all ordinary fires, in a city where there is a fairly good fire department, and while we do not claim that the building is absolutely fire-proof, as it would be if constructed with I-beams and Hollow Tile Arches, we do claim for the system that it is practically proof against fire, and considering the low rate at which the protection is obtained, certainly a most valuable addition to the building trade.

FIRE-PROOFING.

AMONG the recent buildings wholly or partially fire-proofed by us, we refer to the following:

Chronicle Building	San Francisco . .	Burnham & Root .	Architects
California Theatre (in part) .	" .	J. M. Wood . .	"
First National Bank (in part) .	" . .	Wright & Sanders .	"
City Hall	Los Angeles .	Caukin & Haas .	"
County Building	" . .	Curlett, Eisen & Cuthbertson	"
Hall of Records . . .	Woodland, Cal. .	T. J. Welsh . .	"
Holyoke Block (in part) . .	Seattle, W. . .	Geo. W. Dornbach	"
County Building (in part) . .	San Diego . .	Comstock & Trotsche	"

TESTIMONIAL

Covering a Test of Our Hollow Tile Floor Arches.

Office of WRIGHT & SANDERS, Architects.
San Francisco, Oct. 20, 1889.

TO WHOM IT MAY CONCERN:

During the past week we have witnessed a test of a fire clay hollow tile floor arch made by Gladding, McBean & Co., of this city, formed of tiles specially made to our order, which carried a center load of 1600 lbs. per square foot of surface, without showing any signs of fracture. Seventy (70) lbs. was then added, causing a hair crack to appear in the *mortar joint*, along the center line of the arch.

The arch was five feet in span, and the tiles six inches in depth.

WRIGHT & SANDERS.

Roman Brick.

We have recently added to the numerous products of our works, the manufacture of Roman brick, for building purposes.

These modern Roman bricks are one and a-half inches thick, four inches wide, and twelve inches long, and are made of fire-clay, burned to a dark straw color, and are very strong as well as fire-proof.

By reason of their peculiar shape, a skilled mechanic may work innumerable designs in a wall, and will not fail to produce beautiful effects about the doors, windows and cornices. The courses are thin, but when laid and pointed with white or colored mortars, their appearance is both striking and artistic.

When requesting prices, please state quantity required.

TABLE OF WEIGHTS, ETC.

OF ALL SIZES OF

Hollow Tile, for Fire-Proofing Purposes.

ALSO —

Sizes of Iron Beams to be used with Hollow Tile Floor Arches.

HOLLOW TILE FLOOR ARCHES.

Depth of Tile Arch.	Description.	Maximum Safe Span.	Weight per Sq. Ft.	Sizes of Iron I-Beams.			
				14 feet Span and under.	18 feet Span and under.	22 feet Span and under.	26 feet Span and under.
6 in.	Standard.	4 ft. 10 in.	23 lbs.	6 in. l't I-beam	7 in. l't I-beam	8 in. l't I-b'm	10 in. l't I-b'm
7 in.	Standard.	5 ft. 0 in.	25 lbs.	7 in. l't I-beam	8 in. l't I-beam	9 in. l't I-b'm	10 in. l't I-b'm
8 in.	Standard.	5 ft. 6 in.	29 lbs.	7 in. l't I-beam	8 in. l't I-beam	9 in. l't I-b'm	10½ l't I-b'm
9 in.	Standard.	6 ft. 0 in.	33 lbs.	8 in. l't I-beam	9 in. l't I-beam	10 in. l't I-b'm	12 in. l't I-b'm
10 in.	Web.	6 ft. 6 in.	40 lbs.	9 in. l't I-beam	10 in. l't I-beam	10½ l't I-b'm	12 in. he'vy "
6 in.	Large Span.	20 ft. 0 in.	35 lbs.				

The maximum safe span given above is for a uniform load of 250 pounds per square foot, equally distributed upon the floor arches; but in cases of necessity the spans could be increased slightly, without danger of settlement. The sizes of iron I-beams indicated for the different spans of floor arches are based upon practical experience, and are calculated to sustain, including the weight of the construction, a uniformly distributed load of 130 pounds per superficial foot, which is the usual factor for ordinary floors. The iron beams, when set in place, should invariably be bolted together with ¾ inch tie-rods, secured to the web of the beams, and drawn tightly to place with nut and thread. These tie-rods should be set from 8 feet to 10 feet apart.

HOLLOW TILE WALLS AND PARTITIONS.

Thickness of Wall.	Maximum Safe Height.	Maximum Safe Length.	Weight per Square Foot.
2 inches.	15 feet.	20 feet.	10 pounds.
3 inches.	18 feet.	30 feet.	15 pounds.
4 inches.	30 feet.	40 feet.	17 pounds.
5 inches.	35 feet.	55 feet.	20 pounds.
6 inches.	45 feet.	75 feet.	24 pounds.

In one instance our 5-inch tile has formed a partition 40 feet high and 60 feet in length, and given entire satisfaction. We have also built a 4 inch Hollow Tile partition 20 feet long and 132 feet high, without extraneous support. We will make special sizes and forms of partition tile to order.

HOLLOW AND SOLID TILE SUSPENDED CEILING.

Size of Tile	Weight per Sq. Ft.	Description.	Remarks.
½x12x12 in.	7 pounds.	Solid.	Can be applied either to wooden joists or iron beams without reference to their span. See drawing page 64.
3 x12x14½ in.	14½ pounds.	Hollow.	On 3x3 T-irons, see drawing page 60.

HOLLOW TILE ROOFING.

Thickness of Tile.	Sizes of Tile using T-iron purlines.	Weight per Sq. Ft.	Description.	Remarks.
2 inches.	12x18 in. or less.	15 pounds.	Hollow.	Sizes of tile for wood rafters can be made same as for T-iron purlines or less, to suit place where they are to be laid.
3 inches.	12x18 in. or less.	16 pounds.	Hollow.	
3 inches.	12x12 in. or less.	15 pounds.	Hollow.	For Mansard Roofs.
1½ inches.	12x12 in. or less.	8 pounds.	Hollow.	For Mansard Roofs.

On page 58 a full description is given of all the above Roofing Tiles; also information regarding the weathering material suitable to be used with the different kinds.

SOLID TILE FOR FIRE-PROOFING IRON OR WOODEN COLUMNS.

Thickness of Tile.	Diameter of Column.	Weight per Lineal Foot.	Description.	Thickness of Tile.	Diameter of Column.	Weight per Lineal Foot.	Description.
1 inch.	6 inch, round.	22 pounds.	Solid Tile.	1½ inch.	11 inch, round.	54 pounds.	Solid Tile.
1 inch.	7 inch, round.	27 pounds.	Solid Tile.	1½ inch.	12 inch, round.	60 pounds.	Solid Tile.
1¼ inch.	8 inch, round.	39 pounds.	Solid Tile.	1½ inch.	13 inch, round.	64 pounds.	Solid Tile.
1¼ inch.	9 inch, round.	43 pounds.	Solid Tile.	1½ inch.	14 inch, round.	70 pounds.	Solid Tile.
1½ inch.	10 inch, round.	48 pounds.	Solid Tile.	1½ inch.	15 inch, round.	78 pounds.	Solid Tile.

HOLLOW TILE FURRING FOR OUTSIDE WALLS.

Thickness of Furring.	Weight per Square Foot.
1½ inches.	7½ pounds.
2 inches.	8½ pounds.
3 inches.	10 pounds.

Special estimates will be made for any form of Fire-proof Tile required. Samples of Tile sent free on application. Drawings will be made in detail for any particular form of Fire-proof Tile required. Write for prices and any further information desired.

Terra Cotta in Architecture.

One of the most marked improvements connected with the building trade in this country during the past decade is the use of Terra Cotta for the purposes of architectural decoration. Ten years ago a majority of those engaged in the building trade did not know of its existence, so accustomed were they to simple brick-work, painted wood, or decoration in galvanized or cast iron.

Architects and builders now realize that in Terra Cotta they have a fire-proof material of beauty and durability, for the ornamentation of buildings.

The oldest relics of art bear witness to the enduring qualities of Terra Cotta, and many of the most beautiful and costly buildings of to-day prove conclusively its present growing popularity.

We have spared neither time, money nor energy to enable us to offer the best quality of Terra Cotta that can be produced. The bodies of our wares are unexcelled for strength, beauty and durability, and our aim is to have constantly the best artists that are to be procured, so that we may excel from an artistic point of view, as well as in other respects.

On the following pages we have illustrated a few of the designs in Architectural Terra Cotta manufactured by us, for the exterior decoration of buildings.

We can supply at short notice, from our own or special designs,

Red or Buff Terra Cotta Tiles, Panels, Cornices, Window Caps and Sills, Belt and String Courses, Ridge and Hip Tiles, Finials, Keys, Letters, Figures, Etc., Etc.

The Quality and Variety of our Architectural Terra Cotta can be seen in the following Buildings:

San Francisco.	Architect.
Pioneer Hall, Fourth St.	Messrs. Wright & Sanders.
Gladding, McBean & Co.	" " "
S. Lachman, Market and Fremont Sts.	" " "
New California Hotel and Theatre	Mr. J. M. Wood.
New Chronicle Building,	Messrs. Burnham & Root.
Mr. M. H. De Young's Alcazar Building	Mr. Wm. Patton.
Col. Peter Donahue's Union Foundry Block	" "
Mr. Chas. Crocker's Bush St. Building	Mr. Edward R. Swain.
Mrs. J. C. Johnson's, Nos. 3 and 5 Front St.	Mr. H. C. Macy.
Mr. Moses Rosenbaum, Front and California Sts.	Messrs. Saalfield & Kohlberg.
Unitarian Church, Geary and Franklin Sts.	Messrs. Percy & Hamilton.
Children's Play House, Golden Gate Park	" " "
Sharon Warehouse, Jessie St.	Mr. W. F. Smith.
Bishop Building, Sutter St.	" "
Mr. Geo. T. Marye's Building	" "
Messrs. Boyd & Davis', Second and Folsom Sts.	Mr. J. M. Curtis.
Wells, Fargo & Co's, New Montgomery and Mission Sts.	Messrs. Shepley, Rutan & Coolidge.
Mr. E. J. Baldwin's, Market, bet. Fifth and Sixth Sts.	Mr. A. A. Bennett.
Cathedral, Van Ness Ave. and O'Farrell St.	Mr. T. J. Welsh.
Mr. W. H. Crocker's Residence, California and Jones Sts.	Messrs. Curlett & Cuthbertson.
Mrs. M. A. Hampton's Building, Fourth and Minna Sts.	Mr. C. J. I. Devlin.
Mr. Wm. A. Aldrich, Mission St.	Mr. Maguire.
Capt. A. M. Burns' Residence, Washington and Hyde Sts.	Messrs. J. C. Mathews & Son.
Oakland.	
Messrs. Blake & Moffitt's Block, Eighth and Broadway.	Messrs. J. C. Mathews & Son.
St. Mary's College Building	Mr. J. J. Clark.
Berkeley.	
Chemical Laboratory, University of California	Mr. Clinton Day.
Los Angeles.	
Mr. T. D. Mott's, Main St.	Messrs. Boring & Haas.
Mr. Walter S. Maxwell's, Main and Court Sts.	Messrs. Curlett & Cuthbertson.
Mr. L. L. Bradbury's Residence	Messrs. S. & J. C. Newsom.
Women's Christian Temperance Union	Messrs. Caukin & Haas.
Westminster Hotel,	Mr. R. B. Young.
Building, Cor. Spring and First Sts.	" "
Mr. J. B. Lankersham's Main St. Building	" "
F. S. Chadbourne's Building	Messrs. Caukin & Haas.

	Architect.
Sacramento.	
California State Bank	Messrs. Curlett & Cuthbertson.
San Diego.	
Messrs. Morse, Whaley & Dalton's Building	Messrs. Comstock & Trotsche.
Stockton.	
Mr. R. E. Wilhoit's Building	Mr. Wm. G. Copeland.
Mr. A. Washburn's "	
Fresno.	
Southern Pacific Co's Depot Building . . .	Mr. Arthur Brown.
Messrs. Thos. E. Hughes & Son's Hotel . .	Mr. Jas. Seadler.
Pasadena.	
Messrs. Ward Bros. Building	Mr. H. Ridgeway.
First National Bank Building	" "
San Buenaventura.	
Mr. L. J. Rose, Hotel	Messrs. Curlett & Cuthbertson.
Merced.	
Mr. C. H. Huffman's Building	Mr. Chas. R. Manning.
Red Bluff.	
Messrs. Cone & Kimball's Building	Mr. A. A. Cook.
St. Helena.	
Odd Fellows' Hall	Mr. Albert Schropfer.
Mr. T. Parrott's Residence	" "
Tulare.	
Messrs. J. Goldman & Co's Building . . .	Mr. H. C. Macy.
Masonic Hall	" "
Eureka.	
Mr. Wm. Carson's Residence	Messrs. S. & J. C. Newsom.
Bakersfield.	
Southern Pacific Co's Depot Building . . .	Mr. Arthur Brown.
Mayfield.	
Leland Stanford, Jr., University	Messrs. Shepley, Rutan & Coolidge.
Portland, Oregon.	
Mr. J. C. Bayer's Building	
Portland Savings Bank Building	Mr. W. H. Williams.
Building, N. W. corner Morrison and Front Sts. . .	" "
Mr. Levy White's Building	Mr. J. Krumbein.
First Presbyterian Church	Messrs. McCaw & Martin.
Judge Marquam's Theatre and Business Block .	Mr. J. M. Wood.

Astoria, Oregon.

	Architect
Capt. Geo. Flavel's Building	Messrs. Williams & Smith.

Seattle, Washington.

Mrs. Austin A. Bell's Building	Mr. E. H. Fisher.
Mr. H. L. Yesler's Pioneer Building	" "
Starr Estate, Washington Block	" "
Mr. G. Morris Haller's Building	" "
Messrs. Schwabacher Bros. & Co.	" "
Merchants' National Bank Building	Mr. Geo. W. Dornbach.
Messrs. Kittenger & Terry's Block	Mr. H. Steinman.
Hotel Denny	Messrs. Wickersham & Jennings.

Tacoma, Washington.

Messrs. Blackwell & Anderson's Building	Messrs. Pickles & Sutton.
Mr. John Baker's Building	" " "
Mr. T. O. Abbott's Post Office Building	" " "
Gen. J. W. Sprague's Building	" " "
The Thomson Pratt Building	" " "
Mr. Wolf's Block	" " "
Messrs. Barlow & Catlan's Building	Messrs. Proctor & Dennis.

Port Townsend, Washington.

Capt. Tibbals'	Whiteway & Schroeder.

Puyallup, Washington.

Farmers' Bank Building	Mr. C. E. Sears.

Olympia, Washington.

First National Bank Building	Messrs. Parkinson & Evers.

Ellensburgh, Wash.

Kleinburg Bros'. Building	Mr. J. B. Randall.

Victoria, B. C.

Hon. R. Dunsmuir's Residence	Messrs. Williams & Smith.

El Paso, Texas.

Wells, Fargo & Co's Building	Messrs. Stewart & Carpenter.

Carson City, Nevada.

Court House and Post Office Building	U. S. Supervising Architect.

Reno, Nevada.

Southern Pacific Co's Depot	Mr. Arthur Brown.

Price List of Tiles.

(See illustrations on opposite page.)

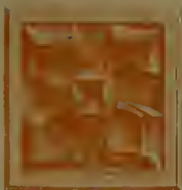
NOTE.—*When ordering any of the TILES listed on this page, please give the dimensions wanted, as well as the number. For instance, if you desire our No. 515 either* 8″ x 8″, 13⅜″ x 13⅜″, *or of any of the other dimensions given in the brace or bracket opposite this number, so state it in your order.*

Number.	Dimensions.	Price each.
500, 505, 510, 515	5¼ x 5¼ inches	$ .35
	8 x 8 inches	.75
	10⅝ x 10⅝ inches	1.50
	13⅜ x 13⅜ inches	2.50
	16⅛ x 16⅛ inches	3.50
520, 525	5 x 5 inches	.30
	7½ x 7½ inches	.60
	10 x 10 inches	1.40
	12½ x 12½ inches	2.00
530, 535, 540	7½ x 7½ inches	.60
	10 x 10 inches	1.40
	12½ x 12½ inches	2.00
	15 x 15 inches	3.00
545	12½ x 12½ inches	2.00
550	8 x 8 inches	.75
	13⅜ x 13⅜ inches	2.50
555, 560	12½ x 12½ inches	2.50
565	15 x 15 inches	4.00
570	10⅝ x 10⅝ inches	2.00

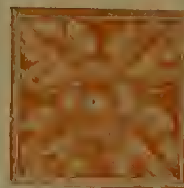
Discount, per cent.

TILES.

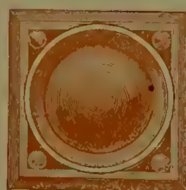
(See prices and dimensions on opposite page.)


No. 500.


No. 505.


No. 510.


No. 515.


No. 520.


No. 525.


No. 530.


No. 535.

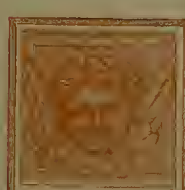

No. 540.


No. 545.


No. 550.


No. 555.


No. 560.


No. 565.

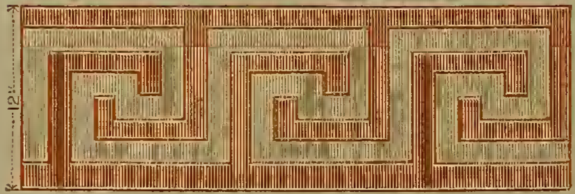

No. 570.

FRIEZES.

No. 600. $2.00 lineal foot.

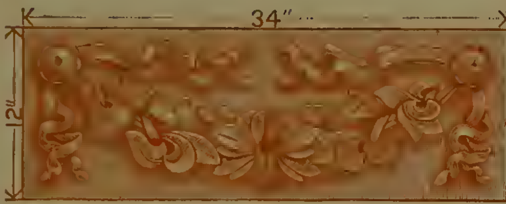
No. 601. $3.50 lineal foot.

No. 602. $2.50 lineal foot.



No. 603. $2.00 lineal foot.

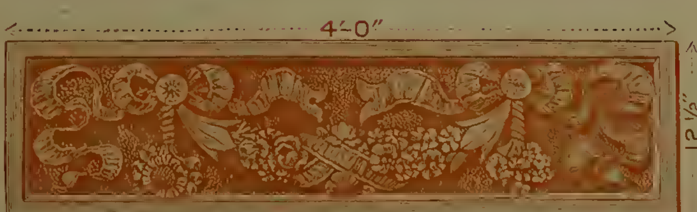
PANELS.



No. 604. Price, $7.50.

No. 605. Price, $7.50.

No. 606. Price, $7.50



No. 607. Price, $10.00.

PANELS.

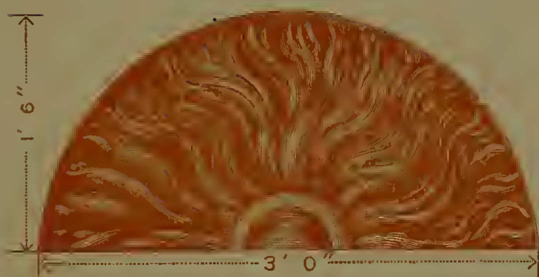
No. 608. Price, $10.00.

No. 609. Price, $6.50.

No. 610. Price, $22.50.

PANELS.

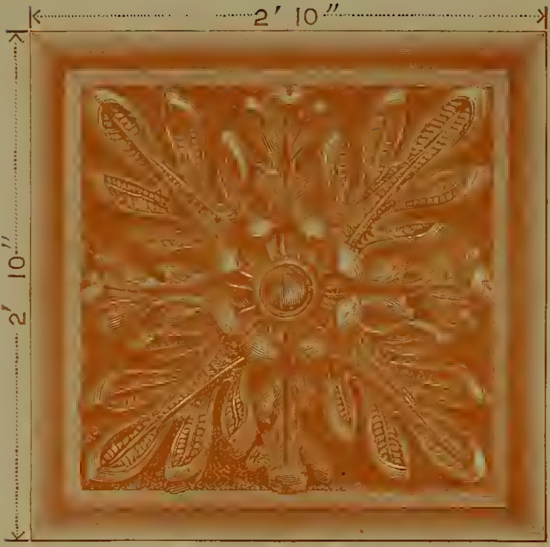
No. 611. Price, $4.00.



No. 612. Price, $8.00.

No. 613. Price, $8.00.

PANELS.

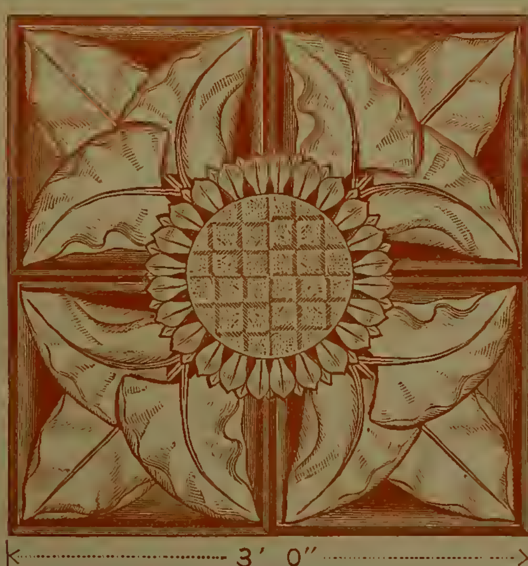


No. 614. Price, $20.00.

No. 615. Price, $35.00.

PANELS.

No. 616. Price, $20.00.



No. 617. Price, $20.00.

MEDALLIONS.

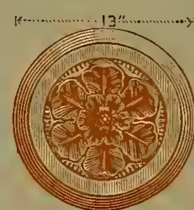
No. 700. Price, $5.00.

No. 701, Price, $5.00.

No. 702. Price, $5.00.

No. 703. Price, $2.50.

No. 704. Price, $8.00.



No. 705. Price, $2.50.

No. 706. Price, $12.50.

No. 707. Price, $25.00.

MEDALLIONS.

No. 708. YOUTH.

No. 709. MANHOOD.

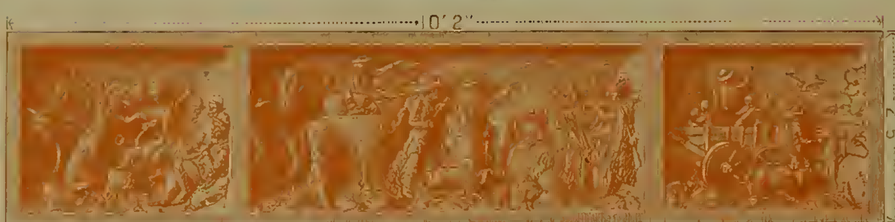
No. 710. MATURITY.

No. 711. GENERAL SUTTER.

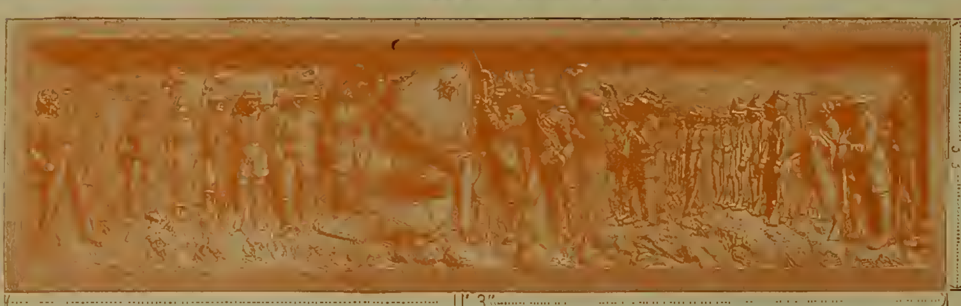
Medallions made for the Pioneer Building, San Francisco. Prices for similar work on application.

MEDALLION and PANELS.

No. 712. LIBERTY.



No. 618. Pioneers Crossing the Plains.



No. 619. Raising the Bear Flag at Sonoma, Cal., 1846.

Medallion and Panels made for the Pioneer Building, San Francisco. Prices given for similar work on application.

PANEL.

Radius, 12′ 9″. Bond, 0′ 4″.

No. 620.

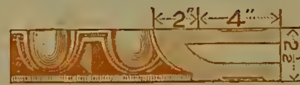
Prices for Similar Work on Application.

MOULDINGS, Etc.

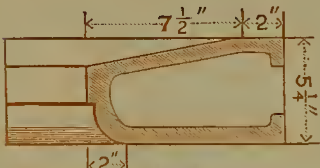
No. 750. 40 cts. foot.

No. 751. 40 cts. foot.

No. 752. 50 cts. foot.

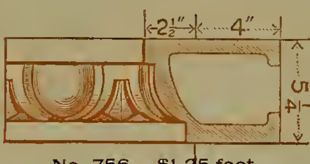


No. 753. 50 cts. foot.



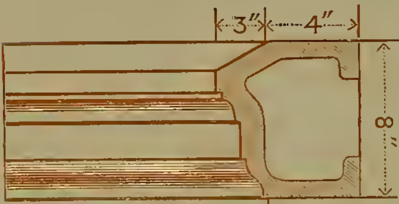
No. 754. $1.25 foot.

No. 755. $1.00 foot.

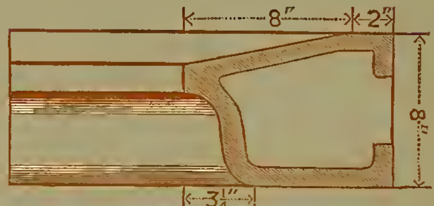


No. 756. $1.25 foot.

No. 757. $1.00 foot.



No. 758. $1.50 foot.



No. 759. $1.75 foot.

No. 760. $1.50 foot.

No. 761. $1.75 foot.

Discount, *Per Cent.*

BELT COURSES.

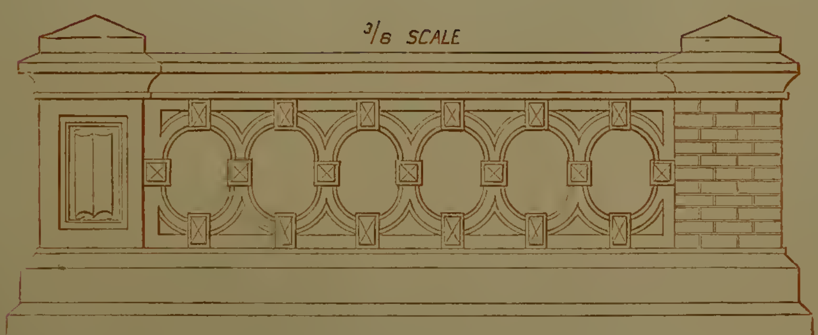
No. 770. $3.00 lineal foot.

No. 771. $2.00 lineal foot.

No. 772. $2.50 lineal foot.

No. 773. $2.50 lineal foot.

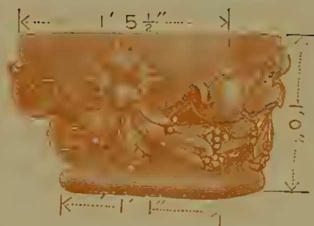
BALUSTRADE.



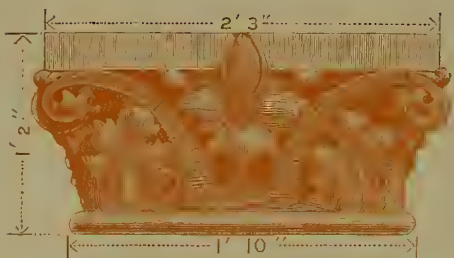
No. 780.

Prices given upon application stating quantity required.

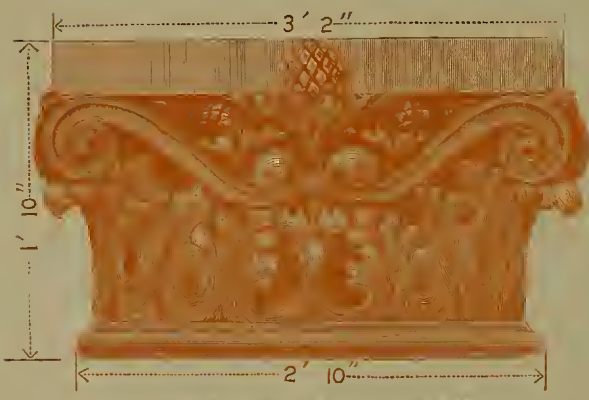
PILASTER CAPS.



No. 800. Returns 0′ 8½″ Price, $7.50.



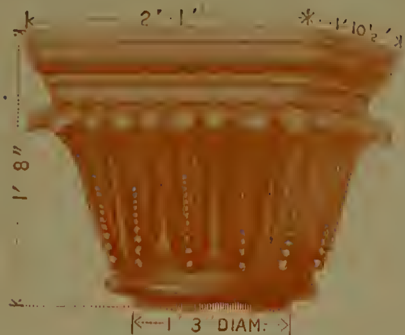
No. 801. Returns 0′ 8½″ Price, $12.50.



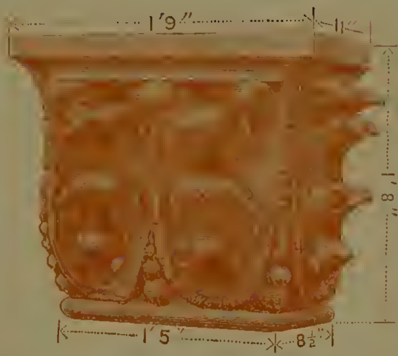
No. 802. Returns 0′ 8½″ Price, $25.00.

We can make the Caps on this page with returns of a greater depth, if desired.

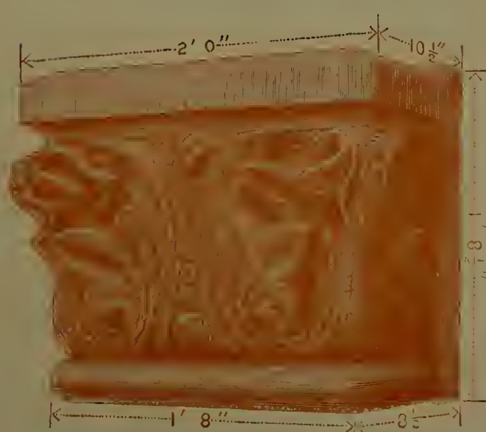
PILASTER CAPS.



No. 803. Price, $30.00.



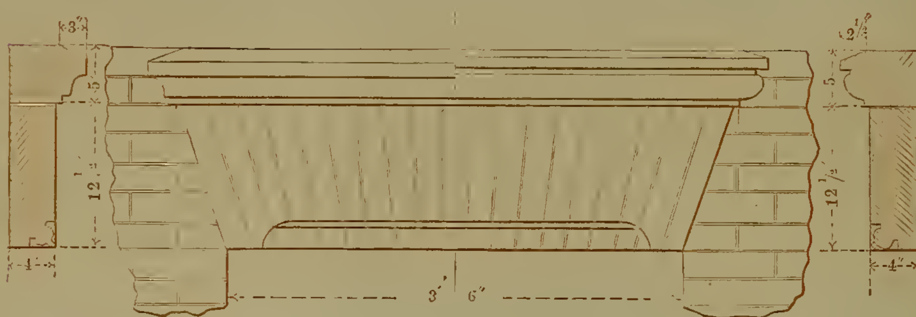
No. 804. Price, $20.00.



No. 805. Price, $20.00.

WINDOW HEADS.

No. 900, $15.00. No. 901, $10.00.

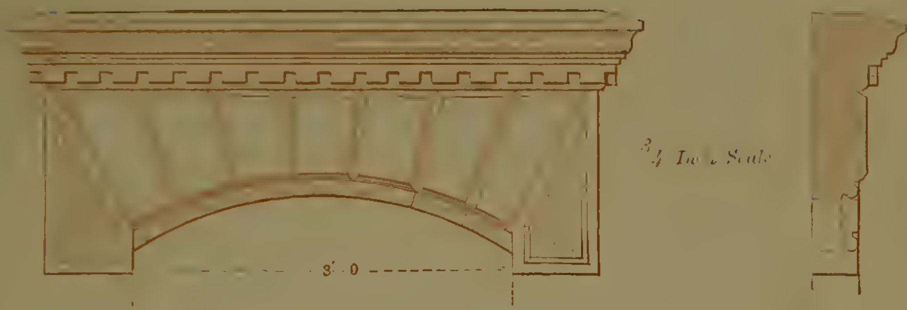


No. 902, $12.50. No. 903, $15.00.

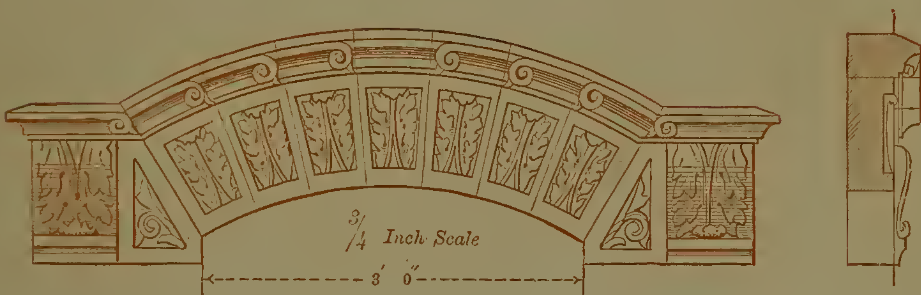
No. 904, $20.00. No. 905. $20.00.

Special Prices on Application, stating quantity and width of opening.

WINDOW HEADS.



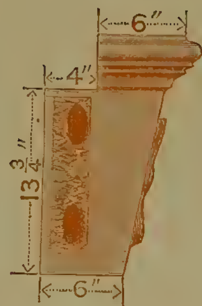
No. 906, $20.00.



No. 907, $20.00.

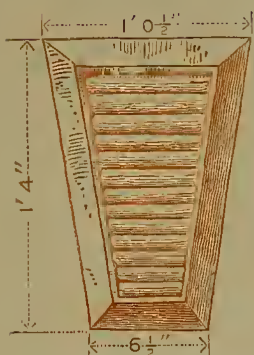
No. 908, $30.00.

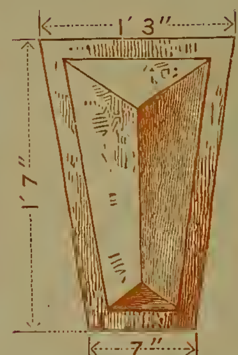
KEYS.



No. 850. Price, $4.00.

No. 851. Price, $5.00.





No. 855. Price, $3.50.

No. 854. Price, $10.00.

No. 856. Price, $5.00.

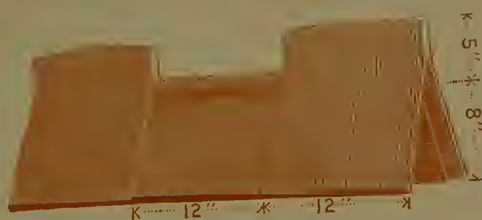
No. 852. Price, $5.00.

No. 853. Price, $5.00.

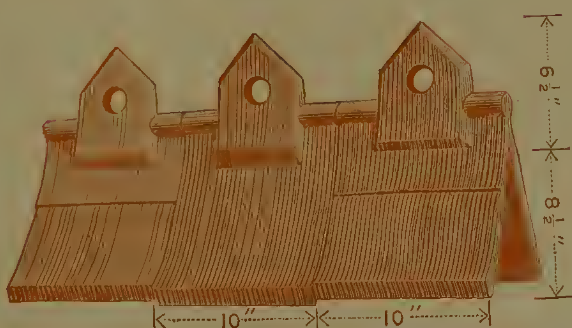
In Ordering, give Radius of Arch.

CRESTINGS.

No. 950. $1.00 lineal foot.



No. 951. $1.25 lineal foot.

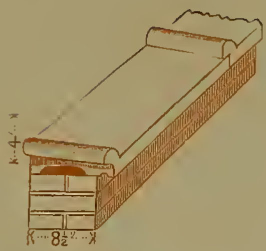


No. 952. $2.00 lineal foot.

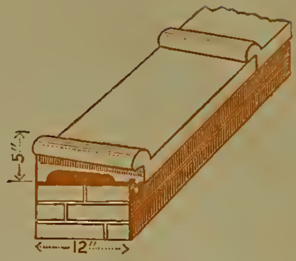
No. 953. $3.00 lineal foot.

NOTE.—Orders should state angles of roofs.

WALL COPING.

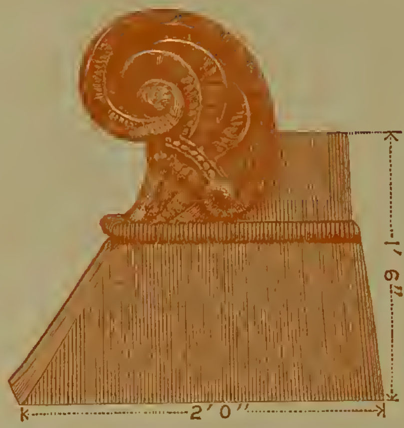


No. 970. 50c. foot.

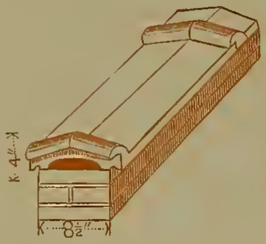


No. 971. 75c. foot.

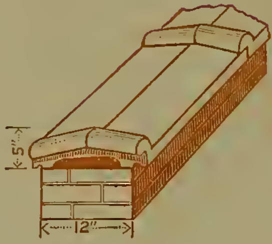
FINIAL.



No. 980. Any Pitch, Price, $7.50.



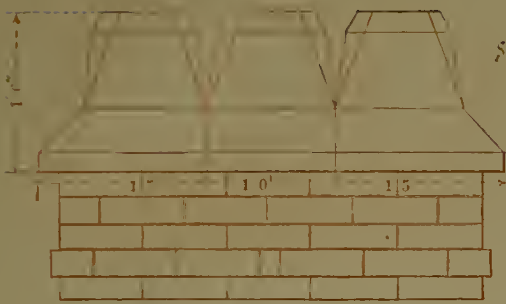
No. 972. 50c. foot.



No. 973. 75c. foot.

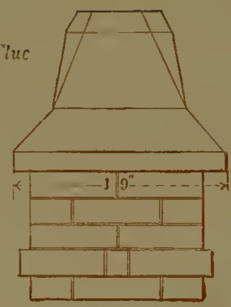
CHIMNEY COPING.

No. 990. No. 991.

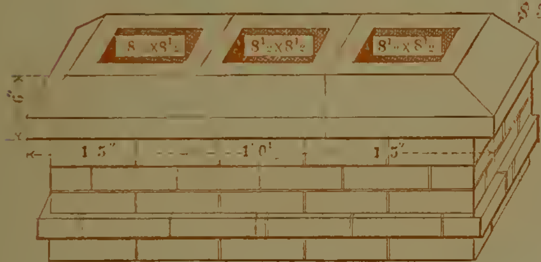


$4.00 Per Flue

No. 992.

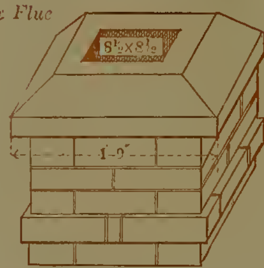


No. 993. No. 994.



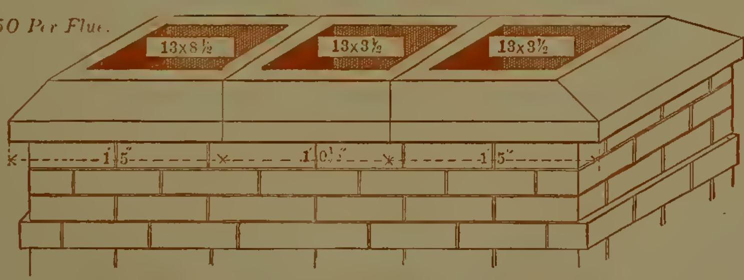
$3.00 Per Flue

No. 995.



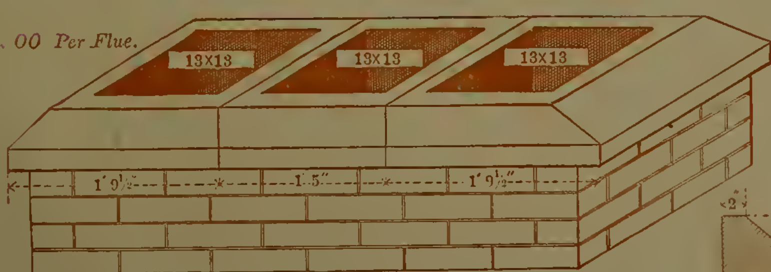
No. 996. No. 997.

$3.50 Per Flue.



No. 998. No. 999.

$4.00 Per Flue.



INDEX.

TABLES.

Testimonial.

As will be seen by the following testimonial, we have been awarded the highest prize for our exhibit of Architectural Terra Cotta, in competition with other manufacturers, at the **Twenty-Fourth Industrial Exposition of the Mechanics' Institute,** recently held in this city:

"We have much pleasure in drawing special attention to the excellent exhibit of Gladding, McBean & Co., showing as it does, marked enterprise as well as laudable and successful effort to establish in California a very notable industry, and displaying considerable perfection, both in technical and artistic qualities of the work produced, which in our opinion ranks with much of the best work produced in the Eastern States and Europe.

"They are entitled to a **Grand Silver Medal** for the best exhibit of **Architectural Terra Cotta.**

"JOHN WRIGHT,
" (Of Messrs. WRIGHT & SANDERS, Architects.)
" G. W. PERCY,
" (Of Messrs. PERCY & HAMILTON, Architects.)
" THOMAS ASHWORTH,
" (Sup't of Public Streets.)
" EDWIN FRETWELL,
"*Committee.*

" In accordance with the recommendation of the committee, a **Grand Silver Medal** was awarded by the Board of Trustees of the Institute.

"J. H. CULVER,
"*Sect'y.*"

NOTICE.

From Six to Eight Weeks' time is required in which to produce Special Designs in Architectural Work. PLEASE ORDER EARLY, to insure Prompt Delivery. All work, unless otherwise specified, will be made with a bond of four inches.